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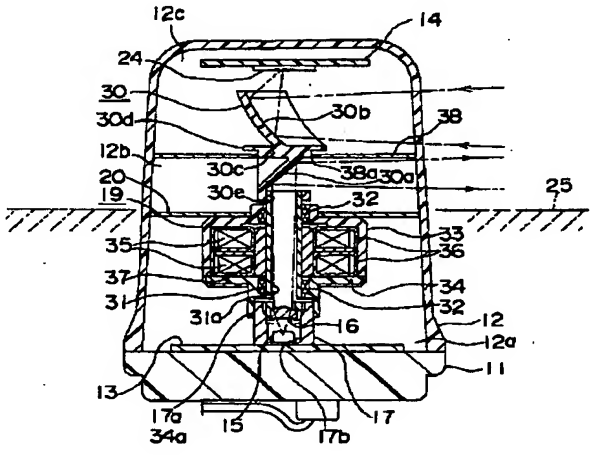
(54)【発明の名称】　車両用光レーダ装置

(57)【要約】

【課題】　この発明は、組立性の向上が図られ、車載時のデザイン上の制約を解消でき、十分な距離測定性能が得られる車両用光レーダ装置を得ることを目的とする。

【解決手段】　発光素子１５がパルスモータ１９の中空軸３１の一端側に配置されている。そして、送光ミラー３０ａおよび受光ミラー３０ｂを一体に成形されたミラー組立体３０が中空軸３１の他端に固着されている。さらに受光素子２４が反射ミラー３０ｂの集光位置に配設されている。発光素子１５から出射された送光ビームは、送光レンズ１６および中空軸３１の中空部３１ａを通って送光ミラー３０ａに導かれケース１２外に送光される。対象物で反射された送光ビームは受光ミラー３０ｂで反射集光され、受光素子２４に受光される。



15:発光素子(発光源)　30:ミラー組立体　33:ハウジング(保持部材)
16:送光レンズ(発光源)　30a:送光ミラー　34:カバー(保持部材)
17:ホルダ(発光源)　30b:受光ミラー　34a:嵌合部(被係合部)
17a:嵌合部(係合部)　30c:胴部(中間部)　38:遮蔽板
19:パルスモータ(アクチュエータ)　30d:鍔部　38a:貫通孔
24:受光素子　31:中空軸(回転駆動軸)
31a:中空部

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【特許請求の範囲】

【請求項１】　送光ビームを出射する発光源と、対象物によって反射される前記送光ビームの反射光を受光する受光素子と、前記送光ビームを反射して前記対象物に照射する送光ミラーと、前記対象物からの前記送光ビームの反射光を反射して前記受光素子に集光させる受光ミラーと、前記送光ミラーおよび前記受光ミラーを同期して回転駆動させるアクチュエータとを有し、前記発光源の送光信号と前記受光素子の受光信号とから前記対象物までの距離を検出する車両用光レーダ装置において、
前記発光源が前記アクチュエータの回転駆動軸の一端面側に配置され、前記受光素子が前記アクチュエータの回転駆動軸の他端面側に配置され、かつ、前記送光ミラーおよび前記受光ミラーが前記アクチュエータの回転駆動軸の同一端面側に配置されていることを特徴とする車両用光レーダ装置。

【請求項２】　送光ミラーおよび受光ミラーがアクチュエータの回転駆動軸の他端面側に配置され、かつ、前記アクチュエータの回転駆動軸が円筒状の中空軸で構成され、発光源から出射された送光ビームを前記中空軸の中空部を通して前記送光ミラーに導くようにしたことを特徴とする請求項１記載の車両用光レーダ装置。

【請求項３】　導光体が中空軸の中空部に配設され、かつ、その端面が凸面に形成され、発光源から出射された送光ビームを前記導光体を通して所定の広がり角に調整して送光ミラーに導くようにしたことを特徴とする請求項２記載の車両用光レーダ装置。

【請求項４】　送光ミラーおよび受光ミラーがアクチュエータの回転駆動軸の一端面側に配置され、前記アクチュエータの回転駆動軸が円筒状の中空軸で構成され、かつ、導光体が前記中空軸の中空部に配設され、対象物からの送光ビームの反射光を前記導光体を通して受光素子に導くようにしたことを特徴とする請求項１記載の車両用光レーダ装置。

【請求項５】　送光ビームを出射する発光源と、対象物によって反射される前記送光ビームの反射光を受光する受光素子と、前記送光ビームを反射して前記対象物に照射する送光ミラーと、前記対象物からの前記送光ビームの反射光を反射して前記受光素子に集光させる受光ミラーと、前記送光ミラーおよび前記受光ミラーを同期して回転駆動させる円筒状の中空軸と、アクチュエータと、前記アクチュエータの回転トルクを前記中空軸に伝達する動力伝達手段とを有し、前記発光源の送光信号と前記受光素子の受光信号とから前記対象物までの距離を検出する車両用光レーダ装置において、
前記発光源が前記中空軸の一端面側に配置され、前記受光素子が前記中空軸の他端面側に配置され、かつ、前記送光ミラーおよび前記受光ミラーが前記中空軸の同一端面側に配置されていることを特徴とする車両用光レーダ装置。

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【請求項６】　送光ミラーおよび受光ミラーが中空軸の他端面側に配置され、発光源から出射された送光ビームを前記中空軸の中空部を通して前記送光ミラーに導くようにしたことを特徴とする請求項５記載の車両用光レーダ装置。

【請求項７】　導光体が中空軸の中空部に配設され、かつ、その端面が凸面に形成され、発光源から出射された送光ビームを前記導光体を通して所定の広がり角に調整して送光ミラーに導くようにしたことを特徴とする請求項６記載の車両用光レーダ装置。

【請求項８】　送光ミラーおよび受光ミラーが中空軸の一端面側に配置され、かつ、導光体が前記中空軸の中空部に配設され、対象物からの送光ビームの反射光を前記導光体を通して受光素子に導くようにしたことを特徴とする請求項５記載の車両用光レーダ装置。

【請求項９】　発光源の構成部材に係合部を設け、かつ、中空軸の保持部材に被係合部を設け、前記係合部を前記被係合部に係合させて、前記発光源から出射される送光ビームの光軸と前記中空軸の軸心とを一致させるようにしたことを特徴とする請求項２又は請求項６記載の車両用光レーダ装置。

【請求項１０】　送光ミラーと受光ミラーとが一体に成形されていることを特徴とする請求項１乃至請求項９のいずれかに記載の車両用光レーダ装置。

【請求項１１】　送光ミラーと受光ミラーとの中間部が遊嵌されて該中間部で送光ミラー側と受光ミラー側とに区画する遮蔽板を設け、かつ、前記中間部周りで前記遮蔽板の厚み方向で該遮蔽板と重なり合う鍔部を前記中間部に設け、前記遮蔽板と前記鍔部とで前記送光ミラー側から前記受光ミラー側への光の漏れを防止するようにしたことを特徴とする請求項１０記載の車両用光レーダ装置。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】この発明は、発光源からビーム光を照射し、対象物からの反射光を受光して該対象物までの距離を検出する車両用光レーダ装置に関し、特に発光源からのビーム光を走査させて広い範囲で対象物を検出する車両用光レーダ装置に関するものである。

【０００２】

【従来の技術】図５は例えば特開平３－１７５３９０号公報に記載された従来の車両用光レーダ装置を示す断面図である。図において、レーザダイオード１、フォトダイオード２、光アイソレータ３、凹面鏡４およびパルスモータ５がケース７内の仕切り板８，９，１０により区画された各スペースにそれぞれ収容されている。そして、凹面鏡４は、レーザダイオード１が配置された位置を焦点位置とするように配置され、パルスモータ５の回転軸に装着されて、レーザダイオード１の光軸を中心軸として回転できるようになっている。また、光アイソレ

ータ３は、レーザダイオード１と凹面鏡４との間に、レーザダイオード１の光軸に対して所定の角度をもって斜めに配置され、レーザダイオード１からのビーム光を透過させて凹面鏡４に導き、かつ、凹面鏡４からの反射光を反射してフォトダイオード２に導くようになっている。さらに、防塵用ガラス板６が凹面鏡４の回転円周方向で該凹面鏡４を包囲するようにケース７に設けられている。なお、各仕切り板８，９，１０には、対象物の検出動作が遂行できるように、ビーム光を通過させる貫通孔が設けられている。

【０００３】つぎに、上記従来の車両用光レーダ装置の動作について説明する。レーザダイオード１から出射された送光ビームは、光アイソレータ３を透過し凹面鏡４に導かれる。そして、凹面鏡４に導かれた送光ビームは、パルスモータ５により回転されている凹面鏡４で反射され、ほぼ平行なビーム光となって、防塵用ガラス板６を透過してケース７外に照射される。このケース７外に照射された送光ビームは、凹面鏡４の回転円周方向に走査され、対象物があれば、該対象物で反射される。そして、対象物で反射された送光ビームの反射光は、防塵用ガラス板６を透過して凹面鏡４に至り、凹面鏡４でレーザダイオード１の方向に反射集光される。この凹面鏡４で反射集光された反射光は、光アイソレータ３で反射されてフォトダイオード２に導かれる。そして、演算処理手段（図示せず）により、レーザダイオード１の発光信号とフォトダイオード２の受光信号とに基づいて、対象物までの距離が演算される。さらに、対象物からの反射光をフォトダイオード２が受光した時のパルスモータ５の励磁相と基準位置との関係から、対象物の方向が検知される。

【０００４】図６は従来の車両用光レーダ装置の他の例を示す断面図である。図において、ポリカーボネート樹脂、アクリル樹脂等の光透過材からなるケース１２が内部を外部から隔離するようにカバー１１に装着されている。そして、ホルダ２０がケース１２内を上下に区画するようにケース１２内に配設されている。アクチュエータとしてのパルスモータ１９はその回転軸１９ａを両側に延出するように構成され、該回転軸１９ａの両端がケース１２内の区画された上下空間に延出するようにホルダ２０に取り付けられている。また、電子回路が組み込まれた基板１３，１４がパルスモータ１９を挟んでケース１２内に配設されている。この基板１３には、レーザダイオード等の発光素子１５が実装されている。さらに、発光素子１５から出射された送光ビームを所定の広がり角に調整する送光レンズ１６がホルダ１７に保持されて実装されている。そして、送光ミラー１８がパルスモータ１９の回転軸１９ａの一端側（基板１３と相対する側）に、該回転軸１９ａの軸心に対して所定の角度をもって斜めに固着されている。この時、発光素子１５の光軸と回転軸１９ａの軸心とは、互いに一致している。

一方、基板１４には、受光光を電気信号に変換するフォトダイオード等の受光素子２４が実装されている。また、パルスモータ１９の回転軸１９ａの他端側（基板１４と相対する側）には、ホルダ２１が嵌着固定されている。このホルダ２１には、対象物からの反射光を受光素子２４に集光する受光レンズ２２が取り付けられ、さらに受光レンズ２２からの反射光の向きを変えて受光素子２４に導く受光ミラー２３が取り付けられている。なお、図中２５は、このように構成された車両用光レーダ装置が装着された車両表面を示している。

【０００５】つぎに、上記従来の車両用光レーダ装置の動作について説明する。車両用レーダ装置が動作している時には、パルスモータ１９が駆動されて、送光ミラー１８と受光レンズ２２とが同期して回転されている。発光素子１５から出射された送光ビームは、送光レンズ１６により所定の広がり角に調整されて送光ミラー１８に導かれる。そして、送光ミラー１８に導かれた送光ビームは、パルスモータ１９により回転されている送光ミラー１８で反射され、ケース１２外に照射される。このケース１２外に照射された送光ビームは、送光ミラー１８の回転円周方向に走査され、対象物があれば、該対象物で反射される。そして、対象物で反射された送光ビームの反射光は、ケース１２を透過して受光レンズ２２に至り、受光レンズ２２で集光される。そして、受光レンズ２２で集光された反射光は、受光ミラー２３で反射されて受光素子２４に導かれる。そして、演算処理手段（図示せず）により、発光素子１５の発光信号と受光素子２４の受光信号とに基づいて、対象物までの距離が演算される。さらに、対象物からの反射光を受光素子２４が受光した時のパルスモータ１９の励磁相と基準位置との関係から、対象物の方向が検知される。この時、送受光のビーム光が車両と干渉しないようにする必要があり、車両用レーダ装置は車両表面２５から飛び出して車両に装着されている。

【０００６】

【発明が解決しようとする課題】図５に示された従来の車両用光レーダ装置は以上のように、レーザダイオード１から出射された送光ビームおよび対象物からの送光ビームの反射光が、同一の光アイソレータ３、凹面鏡４および防塵用ガラス板６で透過あるいは反射されながら、外部に照射され、あるいはフォトダイオード２に受光されている。この送光ビームが外部に照射される過程において、送光ビームはその極一部が光アイソレータ３、凹面鏡４および防塵用ガラス板６で反射あるいは散乱される。そして、光アイソレータ３、凹面鏡４および防塵用ガラス板６で反射あるいは散乱されたこの僅かな送光ビームも、対象物からの反射光とともにフォトダイオード２に受光されてしまう。この僅かな送光ビームは、対象物からの反射光に対して大きな比率を占めることになり、Ｓ／Ｎ比が大幅に低下し、十分な距離測定性能が得

られなくなるという課題があった。一方、図６に示された従来の車両用光レーダ装置は以上のように、パルスモータ１９の一端側に発光素子１５、送光レンズ１６および送光ミラー１８からなる送光光学系を配置し、他端側に受光レンズ２２、受光ミラー２３および受光素子２４からなる受光光学系を配置する構造を採っている。そこで、ケース１２において、送光ビームの送光領域と反射光の受光領域とがパルスモータ１９の回転軸１９ａの軸心方向にパルスモータ１９を挟んで位置しており、また装置を車両に搭載する際に、送受光のビーム光が車両と干渉しないようにする必要があることから、車両表面２５からの装置の飛び出し量が大きくなり、デザイン上問題があるという課題があった。また、送光ミラー１８および受光ミラー２３がパルスモータ１９の回転軸１９ａの各端部に別々に組み込まれているので、送光ビームの送光方向と反射光の受光方向とを精度よく一致させるように送光ミラー１８と受光ミラー２３とを組み込むことが困難であり、さらには発光素子１５および送光レンズ１６を保持するホルダ１７からなる発光源の構成部材による送光ビームの光軸と送光ミラー１８を駆動する回転軸１９ａの軸心とを一致させることが困難であり、部品の加工精度が高精度となるとともに、組立性が低下してしまうという課題もあった。なお、送光ビームの送光方向と反射光の受光方向とが大きくずれると、反射光の受光ができなくなり、また送光ビームの光軸と回転軸１９ａの軸心とが一致していない場合には、送光ビームが回転円周方向に走査される際に、回転軸１９ａの軸方向に変位しつつ走査されることになり、十分な距離測定性能が得られなくなる。

【０００７】この発明は、上記のような課題を解決するためになされたもので、組立性の向上が図られ、車載時のデザイン上の制約が解消され、かつ、十分な距離測定性能が得られる車両用光レーダ装置を得ることを目的とする。

【０００８】

【課題を解決するための手段】この第１の発明に係る車両用光レーダ装置は、送光ビームを出射する発光源と、対象物によって反射される送光ビームの反射光を受光する受光素子と、送光ビームを反射して対象物に照射する送光ミラーと、対象物からの送光ビームの反射光を反射して受光素子に集光させる受光ミラーと、送光ミラーおよび受光ミラーを同期して回転駆動させるアクチュエータとを有し、発光源の送光信号と受光素子の受光信号とから対象物までの距離を検出する車両用光レーダ装置において、発光源がアクチュエータの回転駆動軸の一端面側に配置され、受光素子がアクチュエータの回転駆動軸の他端面側に配置され、かつ、送光ミラーおよび受光ミラーがアクチュエータの回転駆動軸の同一端面側に配置されているものである。

【０００９】また、この第２の発明に係る車両用光レーダ装置は、上記第１の発明において、送光ミラーおよび受光ミラーがアクチュエータの回転駆動軸の他端面側に配置され、かつ、アクチュエータの回転駆動軸が円筒状の中空軸で構成され、発光源から出射された送光ビームを中空軸の中空部を通して送光ミラーに導くようにしたものである。

【００１０】また、この第３の発明に係る車両用光レーダ装置は、上記第２の発明において、導光体が中空軸の中空部に配設され、かつ、その端面が凸面に形成され、発光源から出射された送光ビームを導光体を通して所定の広がり角に調整して送光ミラーに導くようにしたものである。

【００１１】また、この第４の発明に係る車両用光レーダ装置は、上記第１の発明において、送光ミラーおよび受光ミラーがアクチュエータの回転駆動軸の一端面側に配置され、アクチュエータの回転駆動軸が円筒状の中空軸で構成され、かつ、導光体が中空軸の中空部に配設され、対象物からの送光ビームの反射光を導光体を通して受光素子に導くようにしたものである。

【００１２】また、この第５の発明に係る車両用光レーダ装置は、送光ビームを出射する発光源と、対象物によって反射される送光ビームの反射光を受光する受光素子と、送光ビームを反射して対象物に照射する送光ミラーと、対象物からの送光ビームの反射光を反射して受光素子に集光させる受光ミラーと、送光ミラーおよび受光ミラーを同期して回転駆動させる円筒状の中空軸と、アクチュエータと、アクチュエータの回転トルクを中空軸に伝達する動力伝達手段とを有し、発光源の送光信号と受光素子の受光信号とから対象物までの距離を検出する車両用光レーダ装置において、発光源が中空軸の一端面側に配置され、受光素子が中空軸の他端面側に配置され、かつ、送光ミラーおよび受光ミラーが中空軸の同一端面側に配置されているものである。

【００１３】また、この第６の発明に係る車両用光レーダ装置は、上記第５の発明において、送光ミラーおよび受光ミラーが中空軸の他端面側に配置され、発光源から出射された送光ビームを中空軸の中空部を通して送光ミラーに導くようにしたものである。

【００１４】また、この第７の発明に係る車両用光レーダ装置は、上記第６の発明において、導光体が中空軸の中空部に配設され、かつ、その端面が凸面に形成され、発光源から出射された送光ビームを導光体を通して所定の広がり角に調整して送光ミラーに導くようにしたものである。

【００１５】また、この第８の発明に係る車両用光レーダ装置は、上記第５の発明において、送光ミラーおよび受光ミラーが中空軸の一端面側に配置され、かつ、導光体が中空軸の中空部に配設され、対象物からの送光ビームの反射光を導光体を通して受光素子に導くようにしたものである。

【００１６】また、この第９の発明に係る車両用光レーダ装置は、上記第２又は第６の発明において、発光源の構成部材に係合部を設け、かつ、中空軸の保持部材に被係合部を設け、係合部を被係合部に係合させて、発光源から出射される送光ビームの光軸と中空軸の軸心とを一致させるようにしたものである。

【００１７】また、この第１０の発明に係る車両用光レーダ装置は、上記第１乃至第９の発明のいずれかの発明において、送光ミラーと受光ミラーとが一体に成形されているものである。

【００１８】また、この第１１の発明に係る車両用光レーダ装置は、上記第１０発明において、送光ミラーと受光ミラーとの中間部が遊嵌されて該中間部で送光ミラー側と受光ミラー側とに区画する遮蔽板を設け、かつ、中間部周りで遮蔽板の厚み方向で該遮蔽板と重なり合う鍔部を中間部に設け、遮蔽板と鍔部とで送光ミラー側から受光ミラー側への光の漏れを防止するようにしたものである。

【００１９】

【発明の実施の形態】以下、この発明の実施の形態を図について説明する。

実施の形態１．図１はこの発明の実施の形態１に係る車両用光レーダ装置を示す断面図であり、図において図６に示した従来の車両用光レーダ装置と同一または相当部分には同一符号を付し、その説明を省略する。図において、ホルダ１７は有底円筒状に成形され、その上部外周部が係合部としての嵌合部１７ａを構成し、底部に発光素子１５を外径基準で位置決めする貫通孔１７ｂが設けられている。このホルダ１７は、基板１３に実装された発光素子１５を貫通孔１７ｂ内に挿入するようにして基板１３に取り付けられる。そして、送光レンズ１６がホルダ１７内に内径基準に保持されている。ここで、発光源は、発光素子１５、送光レンズ１６およびホルダ１７から構成され、発光素子１５の光軸が、送光レンズ１６の中心を通り、かつ、嵌合部１７ａの中心軸と一致するようになっている。また、アクチュエータとしてのパルスモータ１９は、中空部３１ａを有する回転駆動軸としての中空軸３１がベアリング３２を介して保持部材としてのハウジング３３およびカバー３４に回転自在に装着され、永久磁石３７が中空軸３１の外周に固着され、さらにコイル３５およびコイル３５の磁極を構成するステータ３６が永久磁石３７の周りに配設されて構成されている。このカバー３４には、ホルダ１７の嵌合部１７ａに嵌合される被係合部としての筒状の嵌合部３４ａが中空軸３１と同心状に形成されている。

【００２０】また、ミラー組立体３０は、送光ビームを所定の方向に反射する送光ミラー３０ａ、対象物からの送光ビームの反射光を受光素子２４に反射集光する受光ミラー３０ｂ、送光ミラー３０ａと受光ミラー３０ｂとの中間部にこれらと一体に設けられた円形断面の胴部３０ｃおよびこの胴部３０ｃの受光ミラー３０ｂ側に胴部３０ｃの全周にわたって径方向に延設された鍔部３０ｄとから構成されている。また、送光ミラー３０ａには、ハウジング３３から突出する中空軸３１の先端に嵌合される嵌合穴３０ｅが設けられている。なお、このミラー組立体３０は例えば樹脂材を所望の形状に成形した後、所定の部位にアルミコーティング等の反射コーティングを施して送光ミラー３０ａおよび受光ミラー３０ｂを構成している。ここで、送光ミラー３０ａは中空軸３１の軸心に対して４５°の角度をもつ平面鏡に形成され、受光ミラー３０ｂは凹面鏡に形成されている。さらに、ベース２０および遮蔽板３８がケース１２内に互いに平行に配設されて、ケース１２内がパルスモータ１９を収容する第１の空間１２ａ、送光ミラー３０ａを収容する第２の空間１２ｂおよび受光ミラー３０ｂを収容する第３の空間１２ｃに区画されている。

【００２１】ここで、ミラー組立体３０は、胴部３０ｃが遮蔽板３８の貫通孔３８ａに遊嵌され、送光ミラー３０ａが第２の空間１２ｂ内に位置し、かつ、受光ミラー３０ｂが第３の空間１２ｃ内に位置するように、配置されている。そして、鍔部３０ｄが胴部３０ｃの外周部で遮蔽板３８と中空軸３１の軸心方向で互いに重なり合っている。さらに、第３の空間１２ｃ内には、基板１４に実装された受光素子２４が受光ミラー３０ｃの焦点位置に配設されている。また、パルスモータ１９が、ハウジング３３をベース２０の貫通孔に圧入されて、中空軸３１が第２の空間１２ｂ内に突出するようにベース２０に固着されている。そして、第２の空間１２ｂ内に突出する中空軸３１の先端にミラー組立体３０の嵌合穴３０ｅが圧入され、ミラー組立体３０が中空軸３１に位置決めされて固着されている。さらに、カバー３４に設けられた嵌合部３４ａがホルダ１７の嵌合部１７ａに嵌め込まれ、中空軸３１と基板１３に実装された発光素子１５との位置決めが行われている。

【００２２】このように構成された車両用光レーダ装置は、発光素子１５の光軸と中空軸３１の軸心とが一致され、受光素子２４が発光素子１５の光軸の延長線上に配置され、送光ミラー３０ａと受光ミラー３０ｂとがパルスモータ１９の中空軸３１により同期して回転駆動されるようになっている。そして、この車両用光レーダ装置は、第２および第３の空間１２ｂ，１２ｃが車両表面２５から飛び出すように車両に装着されている。

【００２３】つぎに、この実施の形態１の動作について説明する。車両用レーダ装置が動作している時には、パルスモータ１９が駆動され、中空軸３１が回転される。そして、中空軸３１に固着されているミラー組立体３０が回転される。即ち、送光ミラー３０ａと受光ミラー３０ｂとが同期して中空軸３１の軸心を回転中心として回転される。発光素子１５から出射された送光ビームは、送光レンズ１６により所定の広がり角に調整され、中空

軸３１の中空部３１ａを通って送光ミラー３０ａに導かれる。そして、送光ミラー３０ａに導かれた送光ビームは、送光ミラー３０ａで反射され、ケース１２外に照射される。このケース１２外に照射された送光ビームは、送光ミラー３０ａの回転円周方向に走査され、対象物があれば、該対象物で反射される。そして、対象物で反射された送光ビームの反射光は、ケース１２を透過して第３の空間１２ｃ内の受光ミラー３０ｂに至り、受光ミラー３０ｂで反射集光されて受光素子２４に導かれる。そして、演算処理手段（図示せず）により、発光素子１５の発光信号と受光素子２４の受光信号とに基づいて、対象物までの距離が演算される。さらに、対象物からの反射光を受光素子２４が受光した時のパルスモータ１９の励磁相と基準位置との関係から、対象物の方向が検知される。

【００２４】このように、この実施の形態１によれば、発光素子１５、送光レンズ１６およびホルダ１７からなる発光源がパルスモータ１９の中空軸３１の一端面側に配置され、受光素子２４が中空軸３１の他端面側に配置され、かつ、送光ミラー３０ａおよび受光ミラー３０ｂが中空軸３１の他端面側に配置されている。そこで、車両用光レーダ装置は、中空軸３１の他端面側のみを車両表面２５から飛び出して車両に搭載すればよく、車両表面２５からの飛び出し量を小さくすることができ、車載時のデザイン上の制約を解消することができる。また、送光ミラー３０ａと受光ミラー３０ｂとをミラー組立体３０として一体に成形しているので、送光ビームの走査領域と対象物からの反射光の受光領域とを中空軸３１の軸心方向、即ち車両表面２５からの飛び出し方向で近接させることができ、その分車両表面２５からの装置の飛び出し量を小さくすることができる。また、送光ミラー３０ａと受光ミラー３０ｂとの相対位置が高精度に確保でき、送光ビームの送光方向と反射光の受光方向とが高精度に一致され、精度よく距離測定を行うことができる。また、ミラー組立体３０を中空軸３１の先端に固着するだけで、送光ミラー３０ａと受光ミラー３０ｂとを同期して回転駆動できるようになり、組立性を向上させることができる。

【００２５】また、中空軸３１の中空部３１ａを通して発光素子１５から出射された送光ビームを送光ミラー３０ａに導くようにしているので、発光素子１５から送光ミラー３０ａへの送光ビームの伝達系に特別な光学系を用いる必要がなく、構成の簡素化が図られ、組立性の向上および低コスト化が達成される。また、中空軸３１を支持するカバー３４に設けられた嵌合部３４ａと、ホルダ１７に設けられた嵌合部１７ａとを嵌合させて、ミラー組立体３０の送光ミラー３０ａの回転軸心である中空軸３１の軸心と発光素子１５の光軸とを一致させているので、送光ビームを中空軸３１の軸心方向に変位することなく回転円周方向に走査することができる。また、遮蔽板３８がケース１２内に第２の空間１２ｂと第３の空間１２ｃとに区画するように配設され、ミラー組立体３０の胴部３０ｃが遮蔽板３８の貫通孔３８ａに遊嵌され、かつ、鍔部３０ｄが中空軸３１の軸心方向（遮蔽板３８の厚み方向）で遮蔽板３８と互いに重なり合うようになっている。そこで、第２の空間１２ｂ内で反射あるいは散乱された送光ビームが、遮蔽板３８および鍔部３０ｄにより第３の空間１２ｃ側に入射することが阻止され、受光素子２４に受光されることが防止される。その結果、Ｓ／Ｎ比の低下が抑えられ、十分な距離測定性能が得られる。

【００２６】実施の形態２．図２はこの発明の実施の形態２に係る車両用光レーダ装置を示す断面図である。この実施の形態２におけるミラー組立体３０では、ハウジング３３から突出する中空軸３１の先端に嵌合される嵌合穴３０ｅが受光ミラー３０ｂに設けられている。また、ベース２０および遮蔽板３８がケース１２内に互いに平行に配設されて、ケース１２内がパルスモータ１９を収容する第１の空間１２ａ、受光ミラー３０ｂを収容する第３の空間１２ｃおよび送光ミラー３０ａを収容する第２の空間１２ｂに区画されている。また、パルスモータ１９が、ハウジング３３をベース２０の貫通孔に圧入されて、中空軸３１が第３の空間１２ｃ内に突出するようにベース２０に固着されている。そして、第３の空間１２ｃ内に突出する中空軸３１の先端にミラー組立体３０の嵌合穴３０ｅが圧入され、ミラー組立体３０が中空軸３１に位置決めされて固着されている。このミラー組立体３０は、胴部３０ｃが遮蔽板３８の貫通孔３８ａに遊嵌され、送光ミラー３０ａが第２の空間１２ｂ内に位置し、かつ、受光ミラー３０ｂが第３の空間１２ｃ内に位置するように、配置されている。そして、鍔部３０ｄが胴部３０ｃの外周部で遮蔽板３８と中空軸３１の軸心方向で互いに重なり合っている。

【００２７】受光素子２４は、カバー１１に取り付けられた基板１３上に、中空軸３１の軸端に近接して、かつ、中空軸３１の軸心位置に実装されている。また、発光素子１５は、遮蔽板３８で区画された第２の空間１２ｂ内に、光軸が中空軸３１の軸心と一致するように基板１４上に実装されている。さらに、送光レンズ１６は、発光素子１５の光軸が送光レンズ１６の中心を通るようにホルダ１７に取り付けられている。また、ポリカーボネート樹脂やガラス等の光透過材からなる導光体４０が中空軸３１の中空部３１ａ内に充填されている。

【００２８】つぎに、この実施の形態２の動作について説明する。車両用レーダ装置が動作している時には、パルスモータ１９が駆動され、中空軸３１が回転される。そして、中空軸３１に固着されているミラー組立体３０が回転される。即ち、送光ミラー３０ａと受光ミラー３０ｂとが同期して中空軸３１の軸心を回転中心として回転される。発光素子１５から出射された送光ビームは、

送光レンズ１６により所定の広がり角に調整され、送光ミラー３０ａに導かれる。そして、送光ミラー３０ａに導かれた送光ビームは、送光ミラー３０ａで反射され、第２の空間１２ｂを通ってケース１２外に照射される。このケース１２外に照射された送光ビームは、送光ミラー３０ａの回転円周方向に走査され、対象物があれば、該対象物で反射される。そして、対象物で反射された送光ビームの反射光は、ケース１２を透過して第３の空間１２ｃ内の受光ミラー３０ｂに至り、受光ミラー３０ｂで反射集光されて、中空軸３１の中空部３１ａ内に配設された導光体４０を通り、受光素子２４に導かれる。そして、演算処理手段（図示せず）により、発光素子１５の発光信号と受光素子２４の受光信号とに基づいて、対象物までの距離が演算される。さらに、対象物からの反射光を受光素子２４が受光した時のパルスモータ１９の励磁相と基準位置との関係から、対象物の方向が検知される。

【００２９】このように、この実施の形態２によれば、上記実施の形態１と同様の効果が得られるとともに、受光ミラー３０ｂで反射された対象物からの反射光が導光体４０を介して効率よく受光素子２４に受光され、距離測定性能を向上させることができる。

【００３０】実施の形態３．図３はこの発明の実施の形態３に係る車両用光レーダ装置を示す断面図である。図において、ガラス等の光透過材からなる導光体５０が中空軸３１の中空部３１ａ内に充填され、該導光体５０の先端面が凸面５０ａに成形され、発光素子１５が光軸を中空軸３１の軸心と一致させ、かつ、導光体５０の凸面５０ａに近接して配置されている。なお、他の構成は、上記実施の形態１と同様に構成されている。この実施の形態３では、発光素子１５から出射された送光ビームは、導光体５０を通り所定の広がり角に調整されて送光ミラー３０ａに導かれる。従って、この実施の形態３によれば、上記実施の形態１と同様の効果が得られる。さらに、導光体５０の端面に凸面５０ａを成形してレンズ効果を持たせているので、送光レンズ１６や送光レンズ１６の保持部材が不要となり、発光源の構成部品点数が削減され、その分組立性の向上および低コスト化を図ることができる。

【００３１】実施の形態４．図４はこの発明の実施の形態４に係る車両用光レーダ装置を示す断面図である。図において、パルスモータ１９が第１の空間１２ａ内に配設されている。そして、パルスモータ１９のハウジング３３には、被係合部としての嵌合部３３ａが設けられ、この嵌合部３３ａに発光源を構成部品であるホルダ１７の嵌合部１７ａが嵌合されている。また、円筒状の中空軸５１がベアリング５２を介してベース２０およびハウジング３３に回転自在に取り付けられている。この時、ハウジング３３を介して発光源と中空軸５１とが位置決めされ、中空軸５１の軸心と発光素子１５の光軸とが一致するようになっている。さらに、ミラー組立体３０の嵌合穴３０ｅがベース２０から突出する中空軸５１の先端に嵌合されて、ミラー組立体３０が中空軸５１に位置決めされて固着されている。中空軸５１にはギア５３が一体に成形され、このギア５３がパルスモータ１９の出力軸５４の先端に固着されているピニオン５５にかみあわされている。ここで、ギア５３およびピニオン５５が動力伝達手段を構成している。なお、他の構成は上記実施の形態１と同様に構成されている。

【００３２】つぎに、この実施の形態４の動作について説明する。車両用レーダ装置が動作している時には、パルスモータ１９が駆動され、パルスモータ１９の回転トルクが出力軸５４、ピニオン５５およびギア５３を介して中空軸５１に伝達され、中空軸５１が回転される。そして、中空軸５１に固着されているミラー組立体３０が回転される。即ち、送光ミラー３０ａと受光ミラー３０ｂとが同期して中空軸５１の軸心を回転中心として回転される。そこで、発光素子１５から出射された送光ビームは、送光レンズ１６により所定の広がり角に調整され、中空軸５１の中空部５１ａを通って送光ミラー３０ａに導かれる。そして、送光ミラー３０ａに導かれた送光ビームは、送光ミラー３０ａで反射され、第２の空間１２ｂを通ってケース１２外に照射される。このケース１２外に照射された送光ビームは、送光ミラー３０ａの回転円周方向に走査され、対象物があれば、該対象物で反射される。そして、対象物で反射された送光ビームの反射光は、ケース１２を透過して第３の空間１２ｃ内の受光ミラー３０ｂに至り、受光ミラー３０ｂで反射集光されて受光素子２４に導かれる。そして、演算処理手段（図示せず）により、発光素子１５の発光信号と受光素子２４の受光信号とに基づいて、対象物までの距離が演算される。さらに、対象物からの反射光を受光素子２４が受光した時のパルスモータ１９の励磁相と基準位置との関係から、対象物の方向が検知される。

【００３３】このように、この実施の形態４によれば、駆動源であるパルスモータ１９をミラー組立体３０を回転駆動する中空軸５１と別体で構成しているので、上記実施の形態１に比べて、第１の空間１２ａの容積が大きくなってしまう点を除いて、上記実施の形態１と同様の効果が得られる。

【００３４】なお、上記実施の形態４では、上記実施の形態１の車両用光レーダ装置において、駆動源であるパルスモータ１９をミラー組立体３０を回転駆動する中空軸５１と別体で構成するものとしているが、実施の形態１に限らず、他の実施の形態に適用してもよい。また、上記各実施の形態では、ケース１２として光透過材で構成するものとしているが、ケース１２として可視光カット材を用いれば、距離測定時における可視光による外乱を抑えることができ、測定精度を高めることができる。さらに、発光素子１５から出射される送光ビームを選択

的に透過させるレーザ光透過材を用いれば、測定時における外乱を確実に抑えることができ、測定精度を一層高めることができる。また、上記各実施の形態では、所望の形状に成形された樹脂成型品に反射コーティングを施して、送光ミラーおよび受光ミラーを一体に構成するものとしているが、所望の形状に成形された樹脂成型品に平板の反射鏡および凹面鏡を組みつけて送光ミラーおよび受光ミラーを一体に構成してもよい。あるいは、送光ミラーおよび受光ミラーを別体で成形した後、両者を固着してもよい。

【００３５】

【発明の効果】この発明は、以上のように構成されているので、以下に記載されるような効果を奏する。

【００３６】この第１の発明によれば、送光ビームを出射する発光源と、対象物によって反射される送光ビームの反射光を受光する受光素子と、送光ビームを反射して対象物に照射する送光ミラーと、対象物からの送光ビームの反射光を反射して受光素子に集光させる受光ミラーと、送光ミラーおよび受光ミラーを同期して回転駆動させるアクチュエータとを有し、発光源の送光信号と受光素子の受光信号とから対象物までの距離を検出する車両用光レーダ装置において、発光源がアクチュエータの回転駆動軸の一端面側に配置され、受光素子がアクチュエータの回転駆動軸の他端面側に配置され、かつ、送光ミラーおよび受光ミラーがアクチュエータの回転駆動軸の同一端面側に配置されているので、車載時の車両表面からの飛び出し量を小さくでき、デザイン上の制約を解消できる車両用光レーダ装置が得られる。

【００３７】また、この第２の発明によれば、上記第１の発明において、送光ミラーおよび受光ミラーがアクチュエータの回転駆動軸の他端面側に配置され、かつ、アクチュエータの回転駆動軸が円筒状の中空軸で構成され、発光源から出射された送光ビームを中空軸の中空部を通して送光ミラーに導くようにしたので、光学系の構成が簡素化され、組立性の向上および低コスト化が図られる。

【００３８】また、この第３の発明によれば、上記第２の発明において、導光体が中空軸の中空部に配設され、かつ、その端面が凸面に形成され、発光源から出射された送光ビームを導光体を通して所定の広がり角に調整して送光ミラーに導くようにしたので、発光源の構成部品点数が削減でき、その分組立性の向上および低コスト化が図られる。

【００３９】また、この第４の発明によれば、上記第１の発明において、送光ミラーおよび受光ミラーがアクチュエータの回転駆動軸の一端面側に配置され、アクチュエータの回転駆動軸が円筒状の中空軸で構成され、かつ、導光体が中空軸の中空部に配設され、対象物からの送光ビームの反射光を導光体を通して受光素子に導くようにしたので、反射光が効率よく受光素子に受光され、距離測定性能を向上させることができる。

【００４０】また、この第５の発明によれば、送光ビームを出射する発光源と、対象物によって反射される送光ビームの反射光を受光する受光素子と、送光ビームを反射して対象物に照射する送光ミラーと、対象物からの送光ビームの反射光を反射して受光素子に集光させる受光ミラーと、送光ミラーおよび受光ミラーを同期して回転駆動させる円筒状の中空軸と、アクチュエータと、アクチュエータの回転トルクを中空軸に伝達する動力伝達手段とを有し、発光源の送光信号と受光素子の受光信号とから対象物までの距離を検出する車両用光レーダ装置において、発光源が中空軸の一端面側に配置され、受光素子が中空軸の他端面側に配置され、かつ、送光ミラーおよび受光ミラーが中空軸の同一端面側に配置されているので、車載時の車両表面からの飛び出し量を小さくでき、デザイン上の制約を解消できる車両用光レーダ装置が得られる。

【００４１】また、この第６の発明によれば、上記第５の発明において、送光ミラーおよび受光ミラーが中空軸の他端面側に配置され、発光源から出射された送光ビームを中空軸の中空部を通して送光ミラーに導くようにしたので、光学系の構成が簡素化され、組立性の向上および低コスト化が図られる。

【００４２】また、この第７の発明によれば、上記第６の発明において、導光体が中空軸の中空部に配設され、かつ、その端面が凸面に形成され、発光源から出射された送光ビームを導光体を通して所定の広がり角に調整して送光ミラーに導くようにしたので、発光源の構成部品点数が削減でき、その分組立性の向上および低コスト化が図られる。

【００４３】また、この第８の発明によれば、上記第５の発明において、送光ミラーおよび受光ミラーが中空軸の一端面側に配置され、かつ、導光体が中空軸の中空部に配設され、対象物からの送光ビームの反射光を導光体を通して受光素子に導くようにしたので、反射光が効率よく受光素子に受光され、距離測定性能を向上させることができる。

【００４４】また、この第９の発明によれば、上記第２又は第６の発明において、発光源の構成部材に係合部を設け、かつ、中空軸の保持部材に被係合部を設け、係合部を被係合部に係合させて、発光源から出射される送光ビームの光軸と中空軸の軸心とを一致させるようにしたので、組立性を向上させることができるとともに、送光ビームを中空軸の軸心方向に変位させることなく回転円周方向に走査でき、安定して距離測定を行うことができる。

【００４５】また、この第１０の発明によれば、上記第１乃至第９の発明のいずれかの発明において、送光ミラーと受光ミラーとが一体に成形されているので、組立性を向上させることができるとともに、送光ミラーと受光

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ミラーとの相対的な位置関係が高精度に確保され、送光ビームの送光方向と反射光の受光方向とが高精度に一致でき、精度よく距離測定を行うことができる。また、送光ビームの走査領域を反射光の受光領域とを接近でき、その分車両表面からの飛び出し量を小さくすることができる。

【００４６】また、この第１１の発明によれば、上記第１０発明において、送光ミラーと受光ミラーとの中間部が遊嵌されて該中間部で送光ミラー側と受光ミラー側とに区画する遮蔽板を設け、かつ、中間部周りで遮蔽板の厚み方向で該遮蔽板と重なり合う鍔部を中間部に設け、遮蔽板と鍔部とで送光ミラー側から受光ミラー側への光の漏れを防止するようにしたので、Ｓ／Ｎ比の低下が抑えられ、距離測定性能を向上させることができる。

【図面の簡単な説明】

【図１】　この発明の実施の形態１に係る車両用光レーダ装置を示す断面図である。

【図２】　この発明の実施の形態２に係る車両用光レーダ装置を示す断面図である。

【図３】　この発明の実施の形態３に係る車両用光レーダ装置を示す断面図である。

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【図４】　この発明の実施の形態４に係る車両用光レーダ装置を示す断面図である。

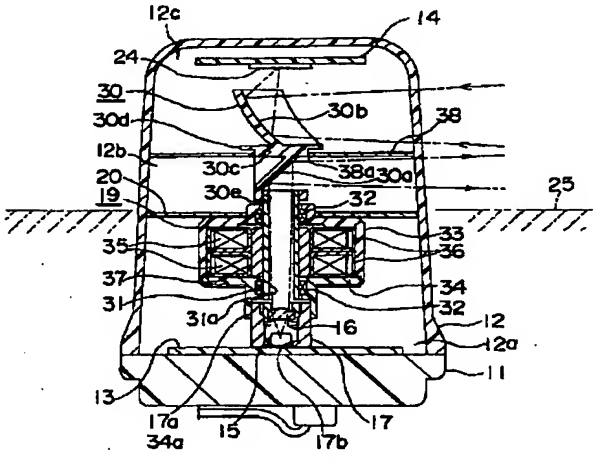
【図５】　従来の車両用光レーダ装置の一例を示す断面図である。

【図６】　従来の車両用光レーダ装置の他の例を示す断面図である。

【符号の説明】

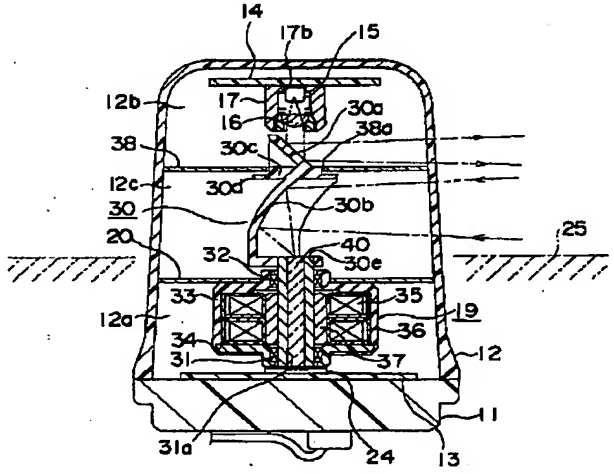
１５　発光素子（発光源）、１６　送光レンズ（発光源）、１７　ホルダ（発光源）、１７ａ　嵌合部（係合部）、１９　パルスモータ（アクチュエータ）、２４　受光素子、３０　ミラー組立体、３０ａ　送光ミラー、３０ｂ　受光ミラー、３０ｃ　胴部（中間部）、３０ｄ　鍔部、３１　中空軸（回転駆動軸）、３１ａ　中空部、３３　ハウジング（保持部材）、３３ａ　嵌合部（係合部）、３４　カバー（保持部材）、３４ａ　嵌合部（被係合部）、３８　遮蔽板、３８ａ貫通孔、４０、５０　導光体、５０ａ　凸面、５１　中空軸、５１ａ　中空部、５３　ギア（動力伝達手段）、５４　ピニオン（動力伝達手段）。

【図１】



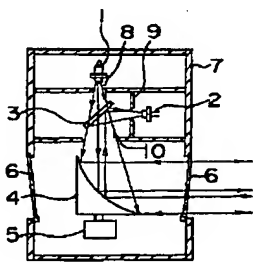
15:発光素子(発光源)　30:ミラー組立体　33:ハウジング(保持部材)
16:送光レンズ(発光源)　30a:送光ミラー　34:カバー(保持部材)
17:ホルダ(発光源)　30b:受光ミラー　34a:嵌合部(被係合部)
17a:嵌合部(係合部)　30c:胴部(中間部)　38:遮蔽板
19:パルスモータ(アクチュエータ)　30d:鍔部　38a:貫通孔
24:受光素子　31:中空軸(回転駆動軸)
31a:中空部

【図２】

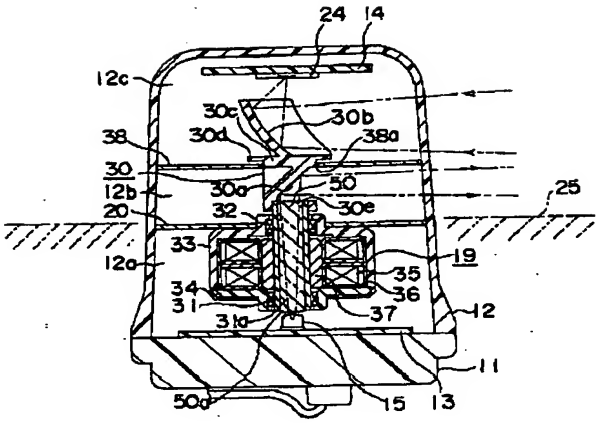


40:導光体

【図５】

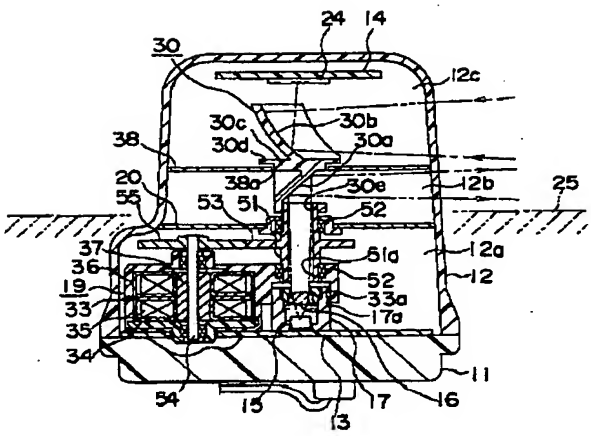


【図３】



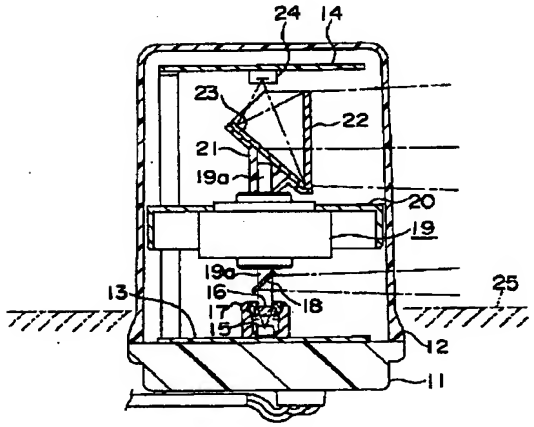
50:導光体
50a:凸面

【図４】



33a:嵌合部(被係合部)
51:中空軸
51a:中空部
53:ギア(動力伝達手段)
55:ピニオン(動力伝達手段)

【図６】



PATENT ABSTRACTS OF JAPAN

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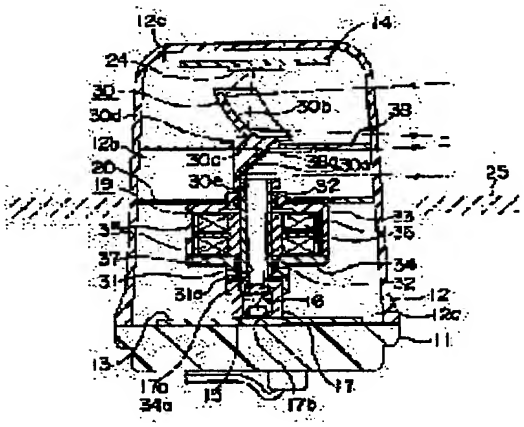
(54) OPTICAL RADAR FOR VEHICLE

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a optical radar for vehicle with easier assembling operation and sufficient function for measuring distance but free from constraints of design for on-vehicle device.
SOLUTION: A luminous element 15 is arranged at one end of a hollow shaft 31 of a pulse motor 19. A mirror assembly 30 which is integrally formed of a light sending mirror 30a and a light receiving mirror 30b is attached at the other end of the hollow shaft 31. Furthermore, a photodetector 24 is located at the condensing position of the reflecting mirror 30b. Light sending beams emitted from the luminous element 15 is carried to the light sending mirror 30a via a light sending lens 16 and the hollow of the hollow shaft 31 and is finally led out of a case 12. The light sending beams reflected at an object are reflected and light-gathered by the light receiving mirror 30b and then received by the photodetector 24.



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* NOTICES *

CLAIMS

[Claim(s)]
[Claim 1] The source of luminescence which carries out outgoing radiation of the light transmission beam, and the photo detector which receives the reflected light of said light transmission beam reflected by the object, The light transmission mirror which reflects said light transmission beam and irradiates said object, and the light-receiving mirror which reflect the reflected light of said light transmission beam from said object, and said photo detector is made to condense, In the optical radar equipment for cars which has the actuator which it synchronizes [actuator] and carries out the rotation drive of said light transmission mirror and said light-receiving mirror, and detects the distance from the light transmission signal of said source of luminescence, and the light-receiving signal of said photo detector to said object Said source of luminescence is arranged at the end side side of the rotation driving shaft of said actuator. Optical radar equipment for cars characterized by arranging said photo detector at the other end side side of the rotation driving shaft of said actuator, and arranging said light transmission mirror and said light-receiving mirror at the same end-face side of the rotation driving shaft of said actuator.
[Claim 2] Optical radar equipment for cars according to claim 1 characterized by making it lead the light transmission beam by which the light transmission mirror and the light-receiving mirror have been arranged at the other end side side of the rotation driving shaft of an actuator, and the rotation driving shaft of said actuator consisted of cylinder-like hollow shafts, and outgoing radiation was carried out from the source of luminescence to said light transmission mirror through the centrum of said hollow shaft.
[Claim 3] Optical radar equipment for cars according to claim 2 characterized by a transparent material being arranged in the centrum of a hollow shaft, and the end face being formed in a convex, adjusting the light transmission beam by which outgoing radiation was carried out from the source of luminescence to a predetermined angle of divergence through said transparent material, and making it lead to a light transmission mirror.
[Claim 4] Optical radar equipment for cars according to claim 1 characterized by a light transmission mirror and a light-receiving mirror being arranged at the end side side of the rotation driving shaft of an actuator, and the rotation driving shaft of said actuator consisting of cylinder-like hollow shafts, and a transparent material being arranged in the centrum of said hollow shaft, and making it lead the reflected light of the light transmission beam from an object to a photo detector through said transparent material.
[Claim 5] The source of luminescence which carries out outgoing radiation of the light transmission beam, and the photo detector which receives the reflected light of said light transmission beam reflected by the object, The light transmission mirror which reflects said light transmission beam and irradiates said object, and the light-receiving mirror which reflect the reflected light of said light transmission beam from said object, and said photo detector is made to condense, The hollow shaft of the shape of a cylinder which it synchronizes [shape] and carries out the rotation drive of said light transmission mirror and said light-receiving mirror, In the optical radar equipment for cars which has an actuator and the power means of communication which transmits the running torque of said actuator to said hollow shaft, and detects the distance from the light transmission signal of said source of luminescence, and the light-receiving signal of said photo detector to said object Optical radar equipment for cars characterized by arranging said source of luminescence at the end side side of said hollow shaft, and arranging said photo detector at the other end side side of said hollow shaft, and arranging said light transmission mirror and said light-receiving mirror at the same end-face side of said hollow shaft.
[Claim 6] Optical radar equipment for cars according to claim 5 characterized by making it lead the light transmission beam to which the light transmission mirror and the light-receiving mirror have been arranged at the other end side side of a hollow shaft, and outgoing radiation was carried out from the source of luminescence to said light transmission mirror through the centrum of said hollow shaft.
[Claim 7] Optical radar equipment for cars according to claim 6 characterized by a transparent material being arranged in the centrum of a hollow shaft, and the end face being formed in a convex, adjusting the

light transmission beam by which outgoing radiation was carried out from the source of luminescence to a predetermined angle of divergence through said transparent material, and making it lead to a light transmission mirror.
[Claim 8] Optical radar equipment for cars according to claim 5 characterized by a light transmission mirror and a light-receiving mirror being arranged at the end side side of a hollow shaft, and a transparent material being arranged in the centrum of said hollow shaft, and making it lead the reflected light of the light transmission beam from an object to a photo detector through said transparent material.
[Claim 9] Optical radar equipment for cars according to claim 2 or 6 characterized by making it make in agreement the axial center of the optical axis and said hollow shaft of the light transmission beam by which prepare the engagement section in the configuration member of the source of luminescence, and prepare an engaged portion in the attachment component of a hollow shaft, said engagement section is made to engage with said engaged portion, and outgoing radiation is carried out from said source of luminescence.
[Claim 10] Optical radar equipment for cars according to claim 1 to 9 characterized by the light transmission mirror and the light-receiving mirror being fabricated by one.
[Claim 11] The shield which the pars intermedia of a light transmission mirror and a light-receiving mirror fits in loosely, and is divided to a light transmission mirror and light-receiving mirror side in this pars intermedia is formed. And optical radar equipment for cars according to claim 10 characterized by preparing the flange which overlaps this shield in the thickness direction of said shield by the circumference of said pars intermedia in said pars intermedia, and preventing the leakage of the light from said light transmission mirror side to said light-receiving mirror side by said shield and said flange.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention irradiates beam light from the source of luminescence, and relates to the optical radar equipment for cars which is made to scan the beam light from the source of luminescence, and detects an object in the large range especially about the optical radar equipment for cars which receives the reflected light from an object and detects the distance to this object.
[0002]
[Description of the Prior Art] Drawing 5 is the sectional view showing the conventional optical radar equipment for cars indicated by JP,3-175390,A. In drawing, it holds in each tooth space to which a laser diode 1, the photodiode 2, the optical isolator 3, the concave mirror 4, and the pulse motor 5 were divided by the diaphragms 8, 9, and 10 within a case 7, respectively. And a concave mirror 4 is arranged so that the location where the laser diode 1 has been arranged may be made into a focal location, the revolving shaft of a pulse motor 5 is equipped with it, and it can rotate now the optical axis of a laser diode 1 as a medial axis. Moreover, between a laser diode 1 and a concave mirror 4, an optical isolator 3 is aslant arranged with a predetermined include angle to the optical axis of a laser diode 1, makes the beam light from a laser diode 1 penetrate, and is led to a concave mirror 4, and reflects the reflected light from a concave mirror 4, and leads it to a photodiode 2. Furthermore, it is prepared in the case 7 so that the glass plate 6 for protection against dust may surround this concave mirror 4 by the rotation circumferencial direction of a concave mirror 4. In addition, the through tube which passes beam light is prepared in each diaphragms 8, 9, and 10 so that detection actuation of an object can be carried out.
[0003] Below, actuation of the above-mentioned conventional optical radar equipment for cars is explained.

The light transmission beam by which outgoing radiation was carried out from the laser diode 1 penetrates an optical isolator 3, and is led to a concave mirror 4. And it is reflected with the concave mirror 4 which is rotating by the pulse motor 5, and the light transmission beam led to the concave mirror 4 serves as an almost parallel beam light, penetrates the glass plate 6 for protection against dust, and is irradiated out of a case 7. If the light transmission beam irradiated out of this case 7 is scanned by the rotation circumferencial direction of a concave mirror 4 and has an object, it will be reflected with this object. And the reflected light of the light transmission beam reflected with the object penetrates the glass plate 6 for protection against dust, and results in a concave mirror 4, and reflective condensing is carried out in the direction of a laser diode 1 with a concave mirror 4. It is reflected with an optical isolator 3 and the reflected light by which reflective condensing was carried out with this concave mirror 4 is led to a photodiode 2. And based on the flashing caution signal of a laser diode 1, and the light-receiving signal of a photodiode 2, the distance to an object calculates with a data-processing means (not shown). Furthermore, the direction of an object is detected from the relation between the excitation phase of the pulse motor 5 when a photodiode 2 receives the reflected light from an object, and a criteria location.

[0004] Drawing 6 is the sectional view showing other examples of the conventional optical radar equipment for cars. In drawing, covering 11 is equipped with the case 12 which consists of light transmission material, such as polycarbonate resin and acrylic resin, so that the interior may be isolated from the exterior. And it is arranged in the case 12 so that a holder 20 may divide the inside of a case 12 up and down. The pulse motor 19 as an actuator is constituted so that the revolving-shaft 19a may be extended on both sides, and it is attached in the holder 20 so that the both ends of this revolving-shaft 19a may extend to the vertical space where it was divided within the case 12. Moreover, the substrates 13 and 14 with which the electronic circuitry was incorporated are arranged in the case 12 on both sides of the pulse motor 19. The light emitting devices 15, such as a laser diode, are mounted in this substrate 13. Furthermore, the light transmission lens 16 which adjusts the light transmission beam by which outgoing radiation was carried out to a predetermined angle of divergence is held and mounted in the holder 17 from the light emitting device 15. And the light transmission mirror 18 has fixed aslant with the predetermined include angle to the axial center of this revolving-shaft 19a to the end side (side which faces a substrate 13) of revolving-shaft 19a of a pulse motor 19. At this time, the optical axis of a light emitting device 15 and the axial center of revolving-shaft 19a are mutually in agreement. On the other hand, the photo detectors 24, such as a photodiode which changes light-receiving light into an electrical signal, are mounted in the substrate 14. Moreover, attachment immobilization of the holder 21 is carried out at the other end side (side which faces a substrate 14) of revolving-shaft 19a of a pulse motor 19. The light-receiving lens 22 which condenses the reflected light from an object to a photo detector 24 is attached in this holder 21, and the light-receiving mirror 23 which changes the sense of the reflected light from the light-receiving lens 22 further, and is led to a photo detector 24 is attached in it. In addition, 25 in drawing shows the car front face where it was equipped with the optical radar equipment for cars constituted in this way.

[0005] Below, actuation of the above-mentioned conventional optical radar equipment for cars is explained. While the radar installation for cars is operating, a pulse motor 19 drives, and the light transmission mirror 18 and the light-receiving lens 22 are synchronizing and rotating. The light transmission beam by which outgoing radiation was carried out from the light emitting device 15 is adjusted to a predetermined angle of divergence by the light transmission lens 16, and is led to the light transmission mirror 18. And it is reflected by the light transmission mirror 18 currently rotated by the pulse motor 19, and the light transmission beam led to the light transmission mirror 18 is irradiated out of a case 12. If the light transmission beam irradiated out of this case 12 is scanned by the rotation circumferencial direction of the light transmission mirror 18 and has an object, it will be reflected with this object. And the reflected light of the light transmission beam reflected with the object penetrates a case 12, results in the light-receiving lens 22, and is condensed with the light-receiving lens 22. And it is reflected by the light-receiving mirror 23, and the reflected light condensed with the light-receiving lens 22 is led to a photo detector 24. And based on the flashing caution signal of a light emitting device 15, and the light-receiving signal of a photo detector 24, the distance to an object calculates with a data-processing means (not shown). Furthermore, the direction of an object is detected from the relation between the excitation phase of the pulse motor 19 when a photo detector 24 receives the reflected light from an object, and a criteria location. It is necessary to make it the beam light of transmission-and-reception light not interfere with a car, and at this time, the radar installation for cars jumps out of the car front face 25, and the car is equipped with it.

[0006]

[Problem(s) to be Solved by the Invention] As mentioned above, while the reflected light of the light transmission beam by which outgoing radiation was carried out from the laser diode 1, and the light

transmission beam from an object is penetrated or reflected with the same optical isolator 3, a concave mirror 4, and the glass plate 6 for protection against dust, the conventional optical radar equipment for cars shown in drawing 5 is irradiated outside, or is received by the photodiode 2. It sets in the process in which this light transmission beam is irradiated outside, and, as for a light transmission beam, those poles part are reflected or scattered about with an optical isolator 3, a concave mirror 4, and the glass plate 6 for protection against dust. And few of this light transmission beam reflected or scattered about with the optical isolator 3, the concave mirror 4, and the glass plate 6 for protection against dust will also be received by the photodiode 2 with the reflected light from an object. A big ratio will be occupied to the reflected light from an object, the S/N ratio fell sharply, and few of this light transmission beam had the technical problem that sufficient range measurement engine performance was no longer obtained. On the other hand, as mentioned above, the conventional optical radar equipment for cars shown in drawing 6 has arranged the light transmission optical system which is from a light emitting device 15, the light transmission lens 16, and the light transmission mirror 18 on the end side of a pulse motor 19, and has taken the structure which arranges the light-receiving optical system which is from the light-receiving lens 22, the light-receiving mirror 23, and a photo detector 24 on an other end side. Then, in the case 12, since it was necessary to make it the beam light of transmission-and-reception light not interfere with a car when the light transmission field of a light transmission beam and the light-receiving field of the reflected light are located in the direction of an axial center of revolving-shaft 19a of a pulse motor 19 on both sides of a pulse motor 19 and equipment is carried in a car, the amount of elutriation of the equipment from the car front face 25 became large, and the technical problem that there was a design top problem occurred. Moreover, since the light transmission mirror 18 and the light-receiving mirror 23 are separately included in each edge of revolving-shaft 19a of a pulse motor 19 It is difficult to incorporate the light transmission mirror 18 and the light-receiving mirror 23 so that the direction of light transmission of a light transmission beam and the light-receiving direction of the reflected light may be made in agreement with a sufficient precision. It is difficult to make in agreement the optical axis of the light transmission beam by the configuration member of the source of luminescence which consists of a holder 17 which furthermore holds a light emitting device 15 and the light transmission lens 16, and the axial center of revolving-shaft 19a which drives the light transmission mirror 18. While the process tolerance of components became highly precise, the technical problem that assembly nature will fall also occurred. In addition, if the direction of light transmission of a light transmission beam and the light-receiving direction of the reflected light shift greatly, when light-receiving of the reflected light becomes impossible and the optical axis of a light transmission beam and the axial center of revolving-shaft 19a are not in agreement, in case a light transmission beam is scanned by the rotation circumferencial direction, it will be scanned displacing to the shaft orientations of revolving-shaft 19a, and sufficient range measurement engine performance is no longer obtained.

[0007] It was made in order to solve the above technical problems, and improvement in assembly nature is achieved, and this invention aims at obtaining the optical radar equipment for cars with which the constraint on the design at the time of mount is canceled, and sufficient range measurement engine performance is obtained.

[0008]

[Means for Solving the Problem] The optical radar equipment for cars concerning this 1st invention The source of luminescence which carries out outgoing radiation of the light transmission beam, and the photo detector which receives the reflected light of the light transmission beam reflected by the object, The light transmission mirror which reflects a light transmission beam and irradiates an object, and the light-receiving mirror which reflect the reflected light of the light transmission beam from an object, and a photo detector is made to condense, In the optical radar equipment for cars which has the actuator which it synchronizes [actuator] and carries out the rotation drive of a light transmission mirror and the light-receiving mirror, and detects the distance from the light transmission signal of the source of luminescence, and the light-receiving signal of a photo detector to an object The source of luminescence is arranged at the end side side of the rotation driving shaft of an actuator, and a photo detector is arranged at the other end side side of the rotation driving shaft of an actuator, and the light transmission mirror and the light-receiving mirror are arranged at the same end-face side of the rotation driving shaft of an actuator.

[0009] Moreover, a light transmission mirror and a light-receiving mirror are arranged at the other end side side of the rotation driving shaft of an actuator, and the rotation driving shaft of an actuator consists of cylinder-like hollow shafts, and it is made for the optical radar equipment for cars concerning this 2nd invention to lead the light transmission beam by which outgoing radiation was carried out from the source of luminescence to a light transmission mirror through the centrum of a hollow shaft in the 1st above-

mentioned invention.
[0010] Moreover, a transparent material is arranged in the centrum of a hollow shaft, and the optical radar equipment for cars concerning this 3rd invention adjusts the light transmission beam by which that end face was formed in the convex and outgoing radiation was carried out from the source of luminescence to a predetermined angle of divergence through a transparent material, and it is made to lead it to a light transmission mirror in the 2nd above-mentioned invention.
[0011] Moreover, a light transmission mirror and a light-receiving mirror are arranged at the end side side of the rotation driving shaft of an actuator, and the rotation driving shaft of an actuator consists of cylinder-like hollow shafts, and a transparent material is arranged in the centrum of a hollow shaft, and it is made for the optical radar equipment for cars concerning this 4th invention to lead the reflected light of the light transmission beam from an object to a photo detector through a transparent material in the 1st above-mentioned invention.
[0012] Moreover, the optical radar equipment for cars concerning this 5th invention The source of luminescence which carries out outgoing radiation of the light transmission beam, and the photo detector which receives the reflected light of the light transmission beam reflected by the object, The light transmission mirror which reflects a light transmission beam and irradiates an object, and the light-receiving mirror which reflect the reflected light of the light transmission beam from an object, and a photo detector is made to condense, The hollow shaft of the shape of a cylinder which it synchronizes [shape] and carries out the rotation drive of a light transmission mirror and the light-receiving mirror, In the optical radar equipment for cars which has an actuator and the power means of communication which transmits the running torque of an actuator to a hollow shaft, and detects the distance from the light transmission signal of the source of luminescence, and the light-receiving signal of a photo detector to an object The source of luminescence is arranged at the end side side of a hollow shaft, and a photo detector is arranged at the other end side side of a hollow shaft, and the light transmission mirror and the light-receiving mirror are arranged at the same end-face side of a hollow shaft.
[0013] Moreover, a light transmission mirror and a light-receiving mirror are arranged at the other end side side of a hollow shaft, and it is made for the optical radar equipment for cars concerning this 6th invention to lead the light transmission beam by which outgoing radiation was carried out from the source of luminescence to a light transmission mirror through the centrum of a hollow shaft in the 5th above-mentioned invention.
[0014] Moreover, a transparent material is arranged in the centrum of a hollow shaft, and the optical radar equipment for cars concerning this 7th invention adjusts the light transmission beam by which that end face was formed in the convex and outgoing radiation was carried out from the source of luminescence to a predetermined angle of divergence through a transparent material, and it is made to lead it to a light transmission mirror in the 6th above-mentioned invention.
[0015] Moreover, a light transmission mirror and a light-receiving mirror are arranged at the end side side of a hollow shaft, and a transparent material is arranged in the centrum of a hollow shaft, and it is made for the optical radar equipment for cars concerning this 8th invention to lead the reflected light of the light transmission beam from an object to a photo detector through a transparent material in the 5th above-mentioned invention.
[0016] Moreover, the optical radar equipment for cars concerning this 9th invention prepares the engagement section in the configuration member of the source of luminescence, and prepares an engaged portion in the attachment component of a hollow shaft, makes the engagement section engage with an engaged portion, and it is made to make in agreement the axial center of the optical axis and hollow shaft of a light transmission beam by which outgoing radiation is carried out from the source of luminescence in the 2nd or 6th above-mentioned invention.
[0017] Moreover, in invention of the above 1st thru/or the 9th invention either, as for the optical radar equipment for cars concerning this 10th invention, the light transmission mirror and the light-receiving mirror are fabricated by one.
[0018] Moreover, the optical radar equipment for cars concerning this 11th invention The shield which the pars intermedia of a light transmission mirror and a light-receiving mirror fits in loosely, and is divided to a light transmission mirror and light-receiving mirror side in the 10th invention of the above in this pars intermedia is formed. And the flange which overlaps this shield in the thickness direction of a shield by the circumference of pars intermedia is prepared in pars intermedia, and the leakage of the light from a light transmission mirror side to a light-receiving mirror side is prevented by the shield and the flange.
[0019]
[Embodiment of the Invention] Hereafter, the gestalt of implementation of this invention is explained about

drawing.
Gestàlt 1. drawing 1 of operation is the sectional view showing the optical radar equipment for cars concerning the gestalt 1 of implementation of this invention, gives the same sign to the same as that of the conventional optical radar equipment for cars shown in drawing 6 in drawing, or a considerable part, and omits that explanation. In drawing, a holder 17 is fabricated in the shape of a closed-end cylinder, the up periphery section constitutes fitting section 17a as the engagement section, and through tube 17b which positions a light emitting device 15 on outer-diameter criteria at the pars basilaris ossis occipitalis is prepared. As this holder 17 inserts the light emitting device 15 mounted in the substrate 13 into through tube 17b, it is attached in a substrate 13. And the light transmission lens 16 is held in the holder 17 at bore criteria. Here, the source of luminescence consists of a light emitting device 15, a light transmission lens 16, and a holder 17, and its optical axis of a light emitting device 15 corresponds the core of the light transmission lens 16 with the medial axis of a passage and fitting section 17a. Moreover, housing 33 and covering 34 as an attachment component are equipped with the hollow shaft 31 as a rotation driving shaft which has centrum 31a free [rotation] through bearing 32, a permanent magnet 37 fixes on the periphery of a hollow shaft 31, the stator 36 which constitutes the magnetic pole of a coil 35 and a coil 35 further is arranged in the surroundings of a permanent magnet 37, and the pulse motor 19 as an actuator is constituted. Tubed fitting section 34a as an engaged portion by which fitting is carried out to fitting section 17a of a holder 17 is concentrically formed in this covering 34 with the hollow shaft 31.
[0020] Moreover, light transmission mirror 30a by which the mirror assembly 30 reflects a light transmission beam in the predetermined direction, Light-receiving mirror 30b which carries out reflective condensing of the reflected light of the light transmission beam from an object at a photo detector 24, It consists of 30d of flanges installed in the pars intermedia of light transmission mirror 30a and light-receiving mirror 30b in the direction of a path over the perimeter of drum section 30c at the light-receiving mirror 30b side of drum section 30c of the circular cross section established in these and one, and this drum section 30c. Moreover, fitting hole 30e by which fitting is carried out is prepared at the tip of the hollow shaft 31 which projects from housing 33 at light transmission mirror 30a. In addition, after this mirror assembly 30 fabricates for example, resin material in a desired configuration, it gives reflective coating, such as aluminum coating, to a predetermined part, and constitutes light transmission mirror 30a and light-receiving mirror 30b. Here, light transmission mirror 30a is formed in the plane mirror which has the include angle of 45 degrees to the axial center of a hollow shaft 31, and light-receiving mirror 30b is formed in the concave mirror. Furthermore, the base 20 and the shield 38 of each other are arranged in parallel in a case 12, and the inside of a case 12 is divided by 3rd space 12c which holds the 2nd space 12b and light-receiving mirror 30b which hold the 1st space 12a which holds a pulse motor 19, and light transmission mirror 30a.
[0021] Here, the mirror assembly 30 is arranged so that drum section 30c may fit loosely into through tube 38a of a shield 38, and light transmission mirror 30a may be located in 2nd space 12b and light-receiving mirror 30b may be located in 3rd space 12c. And 30d of flanges overlaps the shield 38 mutually in the direction of an axial center of a hollow shaft 31 in the periphery section of drum section 30c. Furthermore, in 3rd space 12c, the photo detector 24 mounted in the substrate 14 is arranged by the focal location of light-receiving mirror 30c. Moreover, the pulse motor 19 was pressed fit in the through tube of the base 20 in housing 33, and it has fixed at the base 20 so that a hollow shaft 31 may project in 2nd space 12b. And fitting hole 30e of the mirror assembly 30 was pressed fit at the tip of the hollow shaft 31 which projects in 2nd space 12b, and the mirror assembly 30 was positioned by the hollow shaft 31, and has fixed to it. Furthermore, fitting section 34a prepared in covering 34 is inserted in fitting section 17a of a holder 17, and positioning with a hollow shaft 31 and the light emitting device 15 mounted in the substrate 13 is performed.
[0022] Thus, the axial center of the optical axis and hollow shaft 31 of a light emitting device 15 is in agreement, a photo detector 24 is arranged on the production of the optical axis of a light emitting device 15, light transmission mirror 30a and light-receiving mirror 30b synchronize with the hollow shaft 31 of a pulse motor 19, and the rotation drive of the constituted optical radar equipment for cars is carried out. And the car is equipped with this optical radar equipment for cars so that the 2nd and 3rd space 12b and 12c may jump out of the car front face 25.
[0023] Below, actuation of the gestalt 1 of this operation is explained. While the radar installation for cars is operating, a pulse motor 19 drives and a hollow shaft 31 rotates. And the mirror assembly 30 which has fixed to the hollow shaft 31 rotates. That is, light transmission mirror 30a and light-receiving mirror 30b synchronize, and the axial center of a hollow shaft 31 is rotated as the center of rotation. The light transmission beam by which outgoing radiation was carried out from the light emitting device 15 is adjusted

to a predetermined angle of divergence by the light transmission lens 16, and is led to light transmission mirror 30a through centrum 31a of a hollow shaft 31. And it is reflected by light transmission mirror 30a, and the light transmission beam led to light transmission mirror 30a is irradiated out of a case 12. If the light transmission beam irradiated out of this case 12 is scanned by the rotation circumferencial direction of light transmission mirror 30a and has an object, it will be reflected with this object. And a case 12 is penetrated, it results in light-receiving mirror 30b in 3rd space 12c, reflective condensing is carried out by light-receiving mirror 30b, and the reflected light of the light transmission beam reflected with the object is led to a photo detector 24. And based on the flashing caution signal of a light emitting device 15, and the light-receiving signal of a photo detector 24, the distance to an object calculates with a data-processing means (not shown). Furthermore, the direction of an object is detected from the relation between the excitation phase of the pulse motor 19 when a photo detector 24 receives the reflected light from an object, and a criteria location.

[0024] Thus, according to the gestalt 1 of this operation, the source of luminescence which consists of a light emitting device 15, a light transmission lens 16, and a holder 17 is arranged at the end side side of the hollow shaft 31 of a pulse motor 19, and a photo detector 24 is arranged at the other end side side of a hollow shaft 31, and light transmission mirror 30a and light-receiving mirror 30b are arranged at the other end side side of a hollow shaft 31. Then, that what is necessary is to jump out of the car front face 25, and to carry only the other end side side of a hollow shaft 31 in a car, the optical radar equipment for cars can make small the amount of elutriation from the car front face 25, and can cancel the constraint on the design at the time of mount. Moreover, since it is fabricating to one by using light transmission mirror 30a and light-receiving mirror 30b as the mirror assembly 30, the scan field of a light transmission beam and the light-receiving field of the reflected light from an object can be made to be able to approach in the direction of an axial center of a hollow shaft 31 of elutriation, i.e., the direction from the car front face 25, and the amount of elutriation of the equipment from minute wheel both the front face 25 can be made small. Moreover, the relative position of light transmission mirror 30a and light-receiving mirror 30b can secure with high precision, and the direction of light transmission of a light transmission beam and the light-receiving direction of the reflected light are in agreement with high precision, and can perform range measurement with a sufficient precision. Moreover, it comes to be able to carry out the rotation drive of light transmission mirror 30a and the light-receiving mirror 30b synchronously only by fixing the mirror assembly 30 at the tip of a hollow shaft 31, and assembly nature can be raised.

[0025] Moreover, since he is trying to lead the light transmission beam by which outgoing radiation was carried out from the light emitting device 15 through centrum 31a of a hollow shaft 31 to light transmission mirror 30a, it is not necessary to use optical system special to the transfer system of the light transmission beam from a light emitting device 15 to light transmission mirror 30a, simplification of a configuration is attained, and improvement and low-cost-izing of assembly nature are attained. Moreover, since fitting of fitting section 34a prepared in the covering 34 which supports a hollow shaft 31, and the fitting section 17a prepared in the holder 17 is carried out and the axial center of a hollow shaft 31 and the optical axis of a light emitting device 15 which are the revolving-shaft alignment of light transmission mirror 30a of the mirror assembly 30 are made in agreement, it can scan to a rotation circumferencial direction, without displacing a light transmission beam in the direction of an axial center of a hollow shaft 31. Moreover, it is arranged so that a shield 38 may divide in a case 12 at 2nd space 12b and 3rd space 12c, and drum section 30c of the mirror assembly 30 fits loosely into through tube 38a of a shield 38, and 30d of flanges overlaps a shield 38 mutually in the direction of an axial center of a hollow shaft 31 (the thickness direction of a shield 38). Then, it is prevented that the light transmission beam reflected or scattered about within 2nd space 12b carries out incidence to the 3rd space 12c side by the shield 38 and 30d of flanges, and it is prevented that light is received by the photo detector 24. Consequently, the fall of a S/N ratio is suppressed and sufficient range measurement engine performance is obtained.

[0026] Gestalt 2. drawing 2 of operation is the sectional view showing the optical radar equipment for cars concerning the gestalt 2 of implementation of this invention. In the mirror assembly 30 in the gestalt 2 of this operation, fitting hole 30e by which fitting is carried out is prepared at the tip of the hollow shaft 31 which projects from housing 33 at light-receiving mirror 30b. Moreover, the base 20 and the shield 38 of each other are arranged in parallel in a case 12, and the inside of a case 12 is divided by 2nd space 12b which holds the 3rd space 12c and light transmission mirror 30a which hold the 1st space 12a which holds a pulse motor 19, and light-receiving mirror 30b. Moreover, the pulse motor 19 was pressed fit in the through tube of the base 20 in housing 33, and it has fixed at the base 20 so that a hollow shaft 31 may project in 3rd space 12c. And fitting hole 30e of the mirror assembly 30 was pressed fit at the tip of the hollow shaft 31 which projects in 3rd space 12c, and the mirror assembly 30 was positioned by the hollow

shaft 31, and has fixed to it. This mirror assembly 30 is arranged so that drum section 30c may fit loosely into through tube 38a of a shield 38, and light transmission mirror 30a may be located in 2nd space 12b and light-receiving mirror 30b may be located in 3rd space 12c. And 30d of flanges overlaps the shield 38 mutually in the direction of an axial center of a hollow shaft 31 in the periphery section of drum section 30c.

[0027] On the substrate 13 attached in covering 11, a photo detector 24 approaches the axis end of a hollow shaft 31, and is mounted in the axial center location of a hollow shaft 31. Moreover, in 2nd space 12b divided with the shield 38, the light emitting device 15 is mounted on the substrate 14 so that an optical axis may be in agreement with the axial center of a hollow shaft 31. Furthermore, the light transmission lens 16 is attached in the holder 17 so that the optical axis of a light emitting device 15 may pass along the core of the light transmission lens 16. Moreover, it fills up with the transparent material 40 which consists of light transmission material, such as polycarbonate resin and glass, in centrum 31a of a hollow shaft 31.

[0028] Below, actuation of the gestalt 2 of this operation is explained. While the radar installation for cars is operating, a pulse motor 19 drives and a hollow shaft 31 rotates. And the mirror assembly 30 which has fixed to the hollow shaft 31 rotates. That is, light transmission mirror 30a and light-receiving mirror 30b synchronize, and the axial center of a hollow shaft 31 is rotated as the center of rotation. The light transmission beam by which outgoing radiation was carried out from the light emitting device 15 is adjusted to a predetermined angle of divergence by the light transmission lens 16, and is led to light transmission mirror 30a. And it is reflected by light transmission mirror 30a, and the light transmission beam led to light transmission mirror 30a is irradiated out of a case 12 through 2nd space 12b. If the light transmission beam irradiated out of this case 12 is scanned by the rotation circumferencial direction of light transmission mirror 30a and has an object, it will be reflected with this object. And a case 12 is penetrated, it results in light-receiving mirror 30b in 3rd space 12c, reflective condensing is carried out by light-receiving mirror 30b, and the reflected light of the light transmission beam reflected with the object passes along the transparent material 40 arranged in centrum 31a of a hollow shaft 31, and is led to a photo detector 24. And based on the flashing caution signal of a light emitting device 15, and the light-receiving signal of a photo detector 24, the distance to an object calculates with a data-processing means (not shown). Furthermore, the direction of an object is detected from the relation between the excitation phase of the pulse motor 19 when a photo detector 24 receives the reflected light from an object, and a criteria location.

[0029] Thus, according to the gestalt 2 of this operation, while the same effectiveness as the gestalt 1 of the above-mentioned implementation is acquired, light is efficiently received by the photo detector 24 through a transparent material 40, and the reflected light from the object reflected by light-receiving mirror 30b can raise the range measurement engine performance.

[0030] Gestalt 3. drawing 3 of operation is the sectional view showing the optical radar equipment for cars concerning the gestalt 3 of implementation of this invention. In drawing, fill up with the transparent material 50 which consists of light transmission material, such as glass, in centrum 31a of a hollow shaft 31, the apical surface of this transparent material 50 is fabricated by convex 50a, and a light emitting device 15 makes an optical axis in agreement with the axial center of a hollow shaft 31, and convex 50a of a transparent material 50 is approached, and it is arranged. In addition, other configurations are constituted like the gestalt 1 of the above-mentioned implementation. With the gestalt 3 of this operation, the light transmission beam by which outgoing radiation was carried out from the light emitting device 15 is adjusted to a passage predetermined angle of divergence in a transparent material 50, and is led to light transmission mirror 30a. Therefore, according to the gestalt 3 of this operation, the same effectiveness as the gestalt 1 of the above-mentioned implementation is acquired. Furthermore, since convex 50a is fabricated to the end face of a transparent material 50 and the lens effectiveness is given to it, the attachment component of the light transmission lens 16 or the light transmission lens 16 becomes unnecessary, the component part mark of the source of luminescence are reduced, and improvement and low-cost-izing of the part assembly nature can be attained.

[0031] Gestalt 4. drawing 4 of operation is the sectional view showing the optical radar equipment for cars concerning the gestalt 4 of implementation of this invention. In drawing, the pulse motor 19 is arranged in 1st space 12a. And fitting section 33a as an engaged portion is prepared in the housing 33 of a pulse motor 19, and fitting of the fitting section 17a of the holder 17 which is a component part is carried out to it in the source of luminescence at this fitting section 33a. Moreover, the cylinder-like hollow shaft 51 is attached in the base 20 and housing 33 free [rotation] through bearing 52. At this time, the source of luminescence and a hollow shaft 51 are positioned through housing 33, and the axial center of a hollow

shaft 51 and the optical axis of a light emitting device 15 are in agreement. Furthermore, fitting was carried out at the tip of the hollow shaft 51 with which fitting hole 30e of the mirror assembly 30 projects from the base 20, and the mirror assembly 30 was positioned by the hollow shaft 51, and has fixed to it. A gear 53 is fabricated by the hollow shaft 51 at one, and it bites to the pinion 55 which this gear 53 has fixed at the tip of the output shaft 54 of a pulse motor 19, and is united with it. Here, the gear 53 and the pinion 55 constitute a power means of communication. In addition, other configurations are constituted like the gestalt 1 of the above-mentioned implementation.

[0032] Below, actuation of the gestalt 4 of this operation is explained. While the radar installation for cars is operating, a pulse motor 19 drives, the running torque of a pulse motor 19 is transmitted to a hollow shaft 51 through an output shaft 54, a pinion 55, and a gear 53, and a hollow shaft 51 rotates. And the mirror assembly 30 which has fixed to the hollow shaft 51 rotates. That is, light transmission mirror 30a and light-receiving mirror 30b synchronize, and the axial center of a hollow shaft 51 is rotated as the center of rotation. Then, the light transmission beam by which outgoing radiation was carried out from the light emitting device 15 is adjusted to a predetermined angle of divergence by the light transmission lens 16, and is led to light transmission mirror 30a through centrum 51a of a hollow shaft 51. And it is reflected by light transmission mirror 30a, and the light transmission beam led to light transmission mirror 30a is irradiated out of a case 12 through 2nd space 12b. If the light transmission beam irradiated out of this case 12 is scanned by the rotation circumferencial direction of light transmission mirror 30a and has an object, it will be reflected with this object. And a case 12 is penetrated, it results in light-receiving mirror 30b in 3rd space 12c, reflective condensing is carried out by light-receiving mirror 30b, and the reflected light of the light transmission beam reflected with the object is led to a photo detector 24. And based on the flashing caution signal of a light emitting device 15, and the light-receiving signal of a photo detector 24, the distance to an object calculates with a data-processing means (not shown). Furthermore, the direction of an object is detected from the relation between the excitation phase of the pulse motor 19 when a photo detector 24 receives the reflected light from an object, and a criteria location.

[0033] Thus, since the pulse motor 19 which is a driving source is constituted from the hollow shaft 51 and another object which carry out the rotation drive of the mirror assembly 30 according to the gestalt 4 of this operation, compared with the gestalt 1 of the above-mentioned implementation, the same effectiveness as the gestalt 1 of the above-mentioned implementation is acquired except for the point that the volume of 1st space 12a becomes large.

[0034] In addition, although the hollow shaft 51 and another object which carry out the rotation drive of the mirror assembly 30 shall constitute the pulse motor 19 which is a driving source from the gestalt 4 of the above-mentioned implementation in the optical radar equipment for cars of the gestalt 1 of the above-mentioned implementation, you may apply not only to the gestalt 1 of operation but to the gestalt of other operations. Moreover, with the gestalt of each above-mentioned implementation, although it shall constitute from light transmission material as a case 12, if light cut material is used as a case 12, the disturbance by the light at the time of range measurement can be suppressed, and the accuracy of measurement can be raised. Furthermore, if the laser beam transparency material which makes the light transmission beam by which outgoing radiation is carried out from a light emitting device 15 penetrate alternatively is used, the disturbance at the time of measurement can be suppressed certainly, and the accuracy of measurement can be raised further. Moreover, although reflective coating shall be given to the resin cast fabricated by the desired configuration and the light transmission mirror and the light-receiving mirror shall be constituted from a gestalt of each above-mentioned implementation in one, a monotonous reflecting mirror and a monotonous concave mirror are constructed to the resin cast fabricated by the desired configuration, and a light transmission mirror and a light-receiving mirror may be constituted in one. Or both may be fixed after fabricating a light transmission mirror and a light-receiving mirror with another object.

[0035]

[Effect of the Invention] Since this invention is constituted as mentioned above, it does so effectiveness which is indicated below.

[0036] The source of luminescence which carries out outgoing radiation of the light transmission beam according to this 1st invention, and the photo detector which receives the reflected light of the light transmission beam reflected by the object, The light transmission mirror which reflects a light transmission beam and irradiates an object, and the light-receiving mirror which reflect the reflected light of the light transmission beam from an object, and a photo detector is made to condense, In the optical radar equipment for cars which has the actuator which it synchronizes [actuator] and carries out the rotation drive of a light transmission mirror and the light-receiving mirror, and detects the distance from the light

transmission signal of the source of luminescence, and the light-receiving signal of a photo detector to an object The source of luminescence is arranged at the end side side of the rotation driving shaft of an actuator, and a photo detector is arranged at the other end side side of the rotation driving shaft of an actuator. And since the light transmission mirror and the light-receiving mirror are arranged at the same end-face side of the rotation driving shaft of an actuator, the amount of elutriation from the car front face at the time of mount can be made small, and the optical radar equipment for cars which can cancel the constraint on a design is obtained.

[0037] Moreover, according to this 2nd invention, in the 1st above-mentioned invention, a light transmission mirror and a light-receiving mirror are arranged at the other end side side of the rotation driving shaft of an actuator. And since it was made to lead the light transmission beam to which the rotation driving shaft of an actuator consisted of cylinder-like hollow shafts, and outgoing radiation was carried out from the source of luminescence to a light transmission mirror through the centrum of a hollow shaft, the configuration of optical system is simplified and improvement and low-cost-izing of assembly nature are attained.

[0038] Moreover, since a transparent material is arranged in the centrum of a hollow shaft, and that end face is formed in a convex, the light transmission beam by which outgoing radiation was carried out from the source of luminescence is adjusted to a predetermined angle of divergence through a transparent material in the 2nd above-mentioned invention and it was made to lead to a light transmission mirror according to this 3rd invention, the component part mark of the source of luminescence can be reduced, and improvement and low-cost-izing of that part assembly nature are attained.

[0039] Moreover, according to this 4th invention, in the 1st above-mentioned invention, a light transmission mirror and a light-receiving mirror are arranged at the end side side of the rotation driving shaft of an actuator. Since the rotation driving shaft of an actuator consists of cylinder-like hollow shafts, and a transparent material is arranged in the centrum of a hollow shaft and it was made to lead the reflected light of the light transmission beam from an object to a photo detector through a transparent material Light is efficiently received by the photo detector and the reflected light can raise the range measurement engine performance.

[0040] Moreover, the source of luminescence which carries out outgoing radiation of the light transmission beam according to this 5th invention and the photo detector which receives the reflected light of the light transmission beam reflected by the object, The light transmission mirror which reflects a light transmission beam and irradiates an object, and the light-receiving mirror which reflect the reflected light of the light transmission beam from an object, and a photo detector is made to condense, The hollow shaft of the shape of a cylinder which it synchronizes [shape] and carries out the rotation drive of a light transmission mirror and the light-receiving mirror, In the optical radar equipment for cars which has an actuator and the power means of communication which transmits the running torque of an actuator to a hollow shaft, and detects the distance from the light transmission signal of the source of luminescence, and the light-receiving signal of a photo detector to an object Since the source of luminescence is arranged at the end side side of a hollow shaft, and a photo detector is arranged at the other end side side of a hollow shaft and the light transmission mirror and the light-receiving mirror are arranged at the same end-face side of a hollow shaft The amount of elutriation from the car front face at the time of mount can be made small, and the optical radar equipment for cars which can cancel the constraint on a design is obtained.

[0041] Moreover, since it was made to lead the light transmission beam to which the light transmission mirror and the light-receiving mirror have been arranged at the other end side side of a hollow shaft, and outgoing radiation was carried out from the source of luminescence in the 5th above-mentioned invention to a light transmission mirror through the centrum of a hollow shaft according to this 6th invention, the configuration of optical system is simplified and improvement and low-cost-izing of assembly nature are attained.

[0042] Moreover, since a transparent material is arranged in the centrum of a hollow shaft, and that end face is formed in a convex, the light transmission beam by which outgoing radiation was carried out from the source of luminescence is adjusted to a predetermined angle of divergence through a transparent material in the 6th above-mentioned invention and it was made to lead to a light transmission mirror according to this 7th invention, the component part mark of the source of luminescence can be reduced, and improvement and low-cost-izing of that part assembly nature are attained.

[0043] Moreover, since a light transmission mirror and a light-receiving mirror are arranged at the end side side of a hollow shaft, and a transparent material is arranged in the centrum of a hollow shaft in the 5th above-mentioned invention and it was made to lead the reflected light of the light transmission beam from an object to a photo detector through a transparent material according to this 8th invention, light is

efficiently received by the photo detector and the reflected light can raise the range measurement engine performance.
[0044] Moreover, according to this 9th invention, it sets to the 2nd or 6th above-mentioned invention. Since it was made to make in agreement the axial center of the optical axis and hollow shaft of a light transmission beam by which prepare the engagement section in the configuration member of the source of luminescence, and prepare an engaged portion in the attachment component of a hollow shaft, the engagement section is made to engage with an engaged portion, and outgoing radiation is carried out from the source of luminescence While being able to raise assembly nature, it can scan to a rotation circumferencial direction, without making the variation rate of the light transmission beam carry out in the direction of an axial center of a hollow shaft, it is stabilized, and range measurement can be performed.
[0045] Moreover, since the light transmission mirror and the light-receiving mirror are fabricated by one, while being able to raise assembly nature in invention of the above 1st thru/or the 9th invention either according to this 10th invention, the relative physical relationship of a light transmission mirror and a light-receiving mirror is secured with high precision, and the direction of light transmission of a light transmission beam and the light-receiving direction of the reflected light can be in agreement with high precision, and can perform range measurement with a sufficient precision. Moreover, the light-receiving field of the reflected light can be approached in the scan field of a light transmission beam, and the amount of elutriation from minute wheel both the front face can be made small.
[0046] Moreover, according to this 11th invention, the shield which the pars intermedia of a light transmission mirror and a light-receiving mirror fits in loosely, and is divided to a light transmission mirror and light-receiving mirror side in the 10th invention of the above in this pars intermedia is formed. And since the flange which overlaps this shield in the thickness direction of a shield by the circumference of pars intermedia is prepared in pars intermedia and the leakage of the light from a light transmission mirror side to a light-receiving mirror side was prevented by the shield and the flange, the fall of a S/N ratio is suppressed and the range measurement engine performance can be raised.

[Translation done.]

* NOTICES *

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2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the sectional view showing the optical radar equipment for cars concerning the gestalt 1 of implementation of this invention.
[Drawing 2] It is the sectional view showing the optical radar equipment for cars concerning the gestalt 2 of implementation of this invention.
[Drawing 3] It is the sectional view showing the optical radar equipment for cars concerning the gestalt 3 of implementation of this invention.
[Drawing 4] It is the sectional view showing the optical radar equipment for cars concerning the gestalt 4 of implementation of this invention.
[Drawing 5] It is the sectional view showing an example of the conventional optical radar equipment for cars.
[Drawing 6] It is the sectional view showing other examples of the conventional optical radar equipment for cars.
[Description of Notations]
15 Light Emitting Device (Source of Luminescence), 16 Light Transmission Lens (Source of Luminescence), 17 Holder (Source of Luminescence), 17a The fitting section (engagement section), 19 Pulse motor

(actuator), 24 A photo detector, 30 A mirror assembly, 30a Light transmission mirror, 30b A light-receiving mirror, 30c A drum section (pars intermedia), 30d Flange, 31 Hollow shaft (rotation driving shaft), 31a A centrum, 33 Housing (attachment component), 33a The fitting section (engagement section), 34 Covering (attachment component), 34a Fitting section (engaged portion), 38 40 A shield, 38a through tube, 50 Transparent material, 50a A convex, 51 Hollow shaft, 51a A centrum, 53 A gear (power means of communication) and 54 Pinion (power means of communication).

[Translation done.]

* NOTICES *

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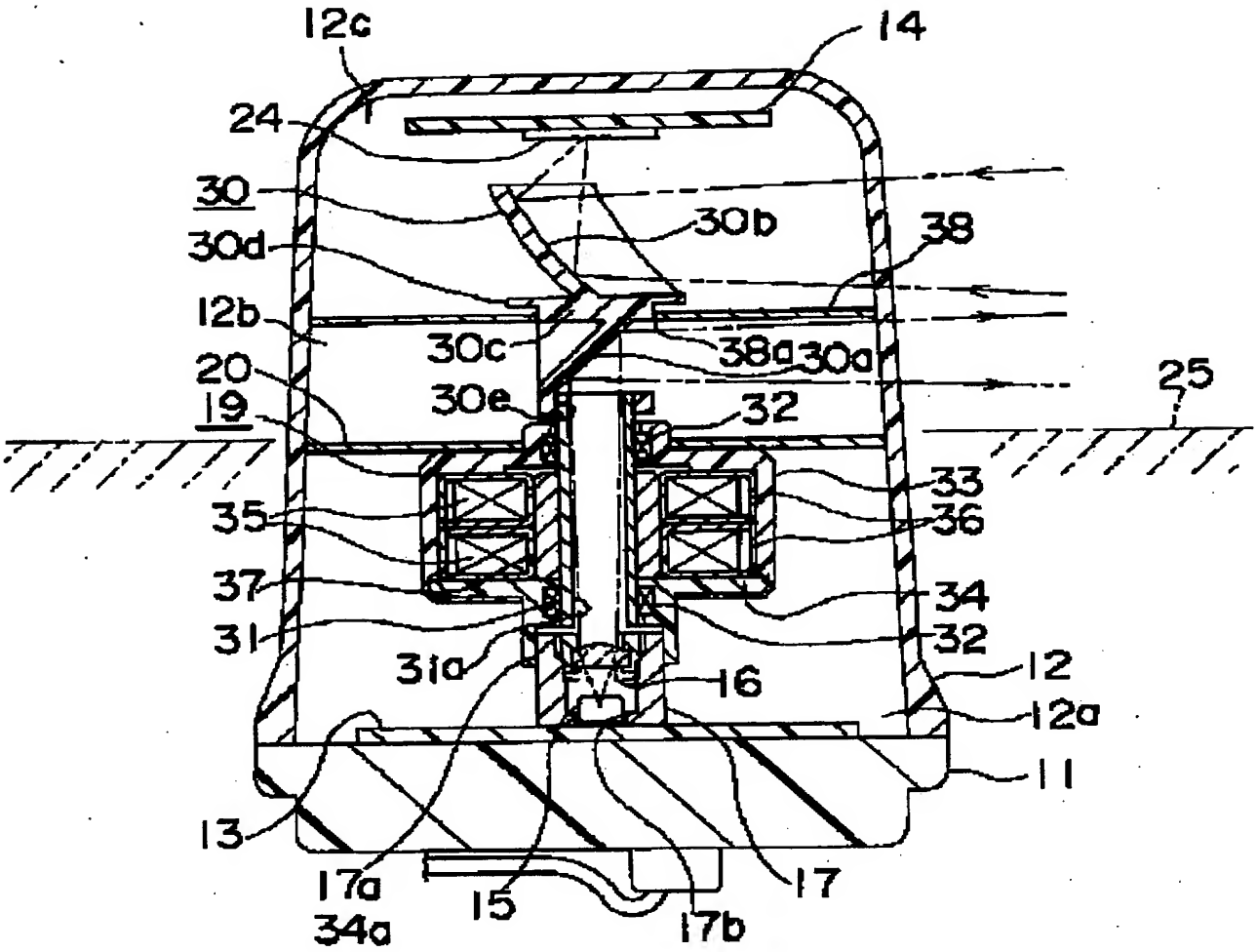
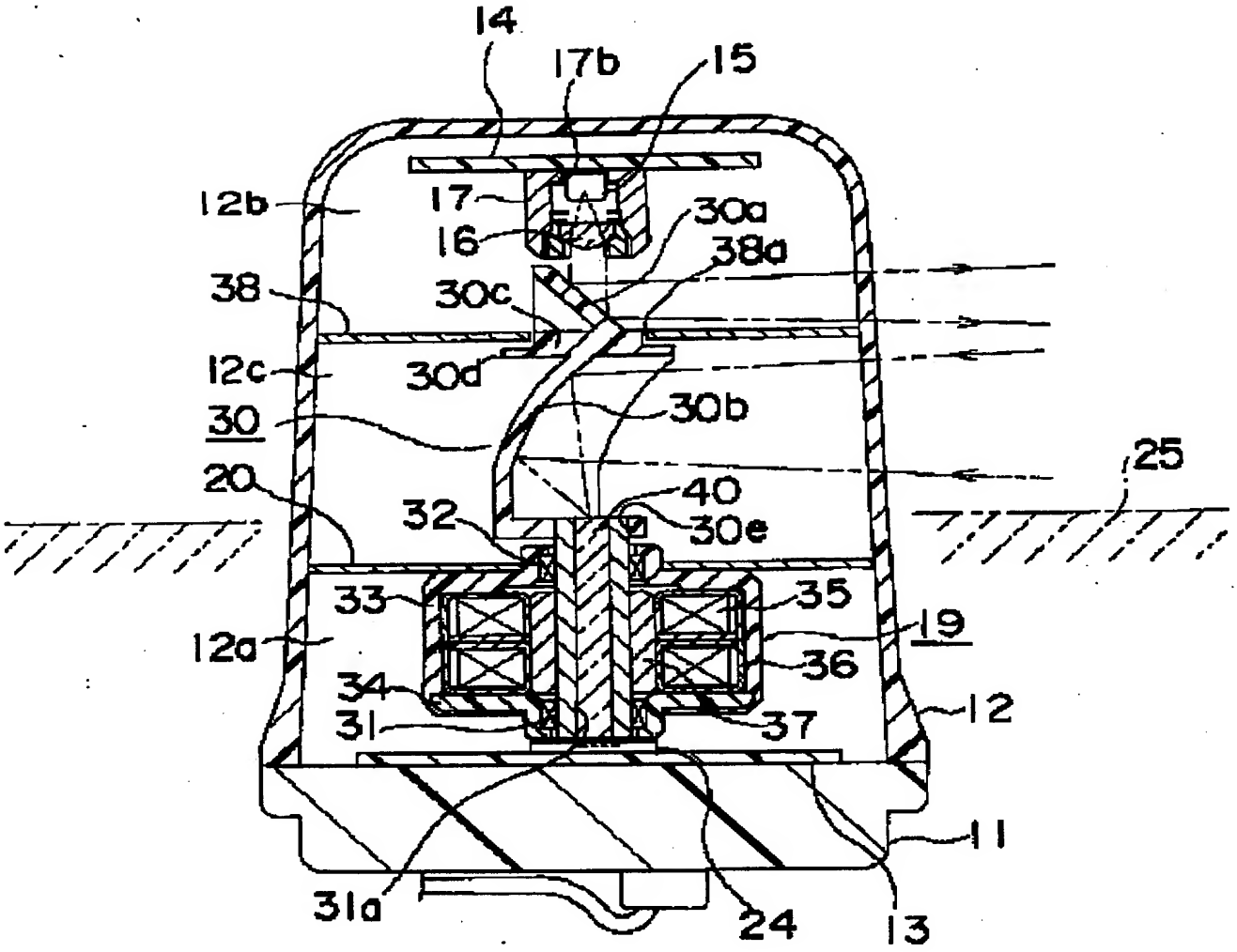
DRAWINGS

[Drawing 1]



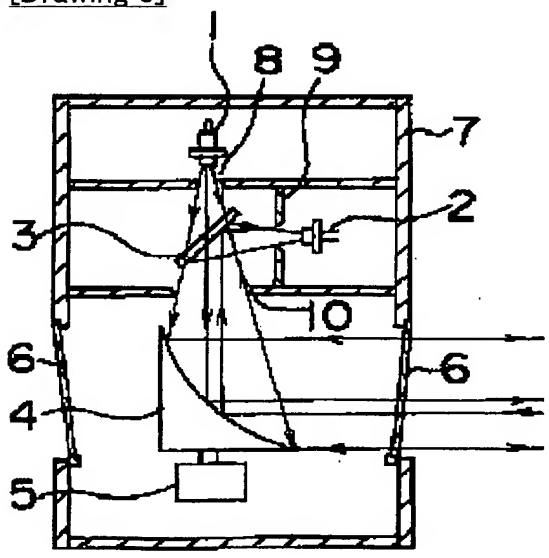
15:発光素子(発光源)　30:ミラー組立体　33:ハウジング(保持部材)
16:送光レンズ(発光源)　30a:送光ミラー　34:カバー(保持部材)
17:ホルダ(発光源)　30b:受光ミラー　34a:嵌合部(被係合部)
17a:嵌合部(係合部)　30c:胴部(中間部)　38:遮蔽板
19:パルスモータ(アクチュエータ)　30d:鍔部　38a:貫通孔
24:受光素子　31:中空軸(回転駆動軸)
31a:中空部

[Drawing 2]

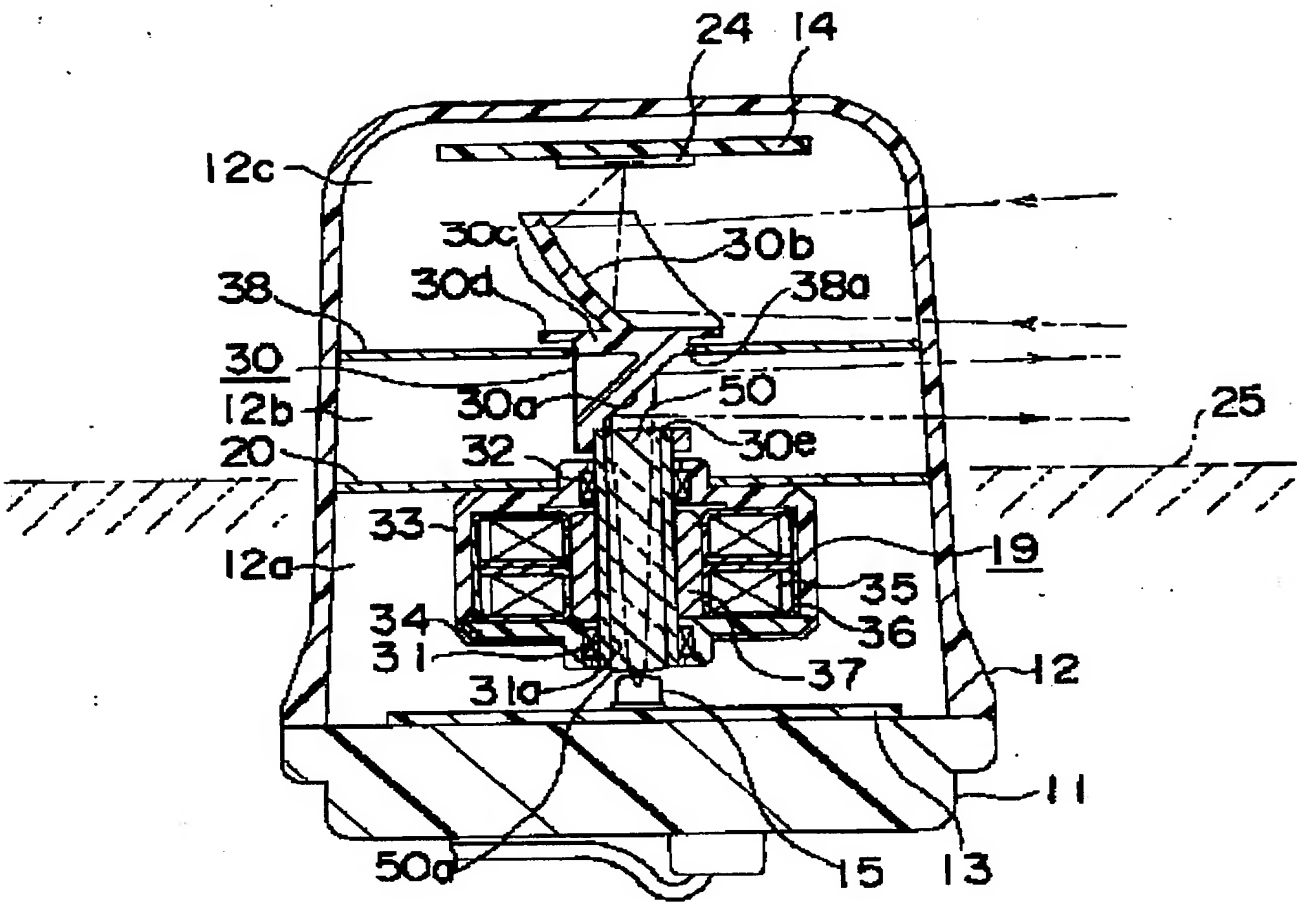


40:導光体

[Drawing 5]

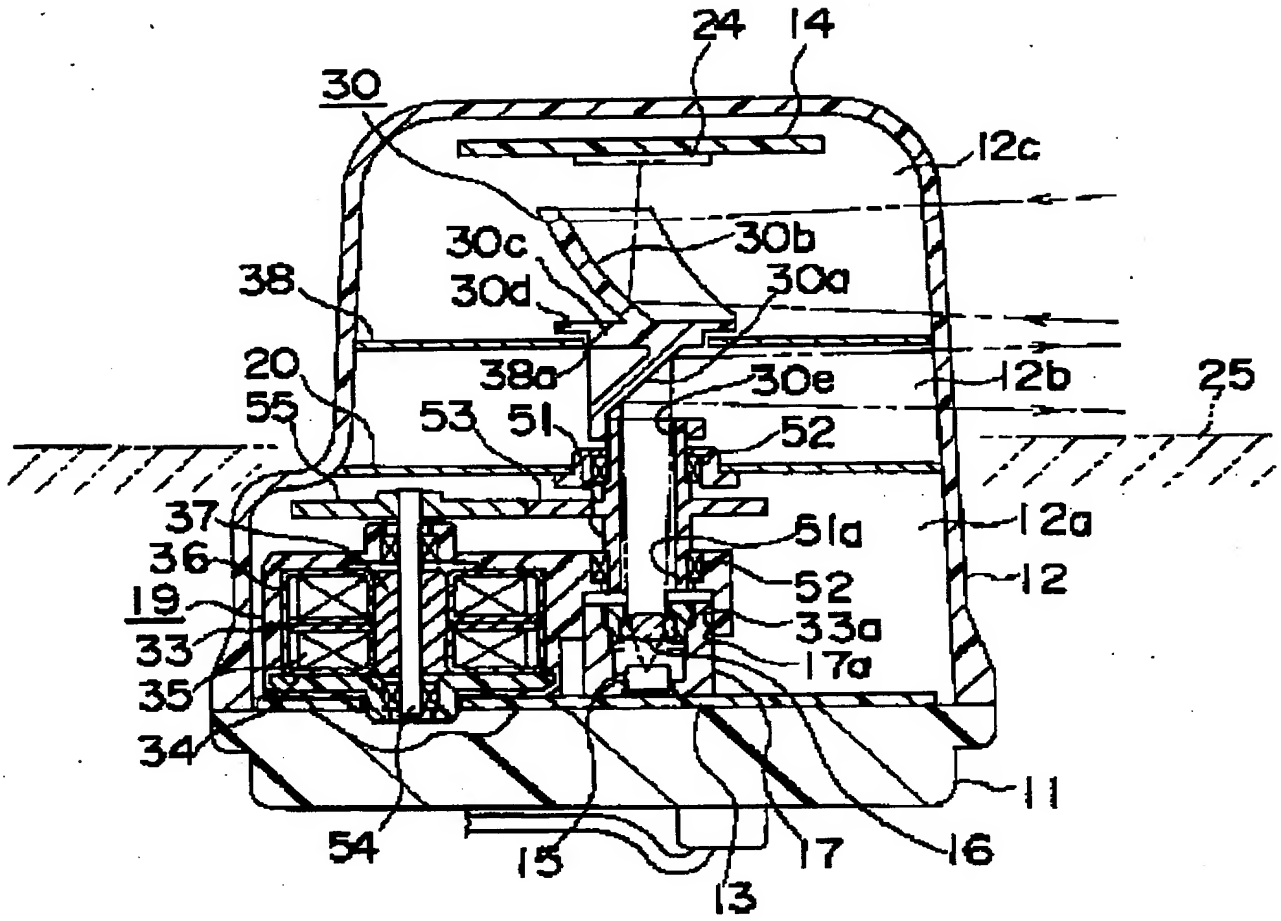


[Drawing 3]



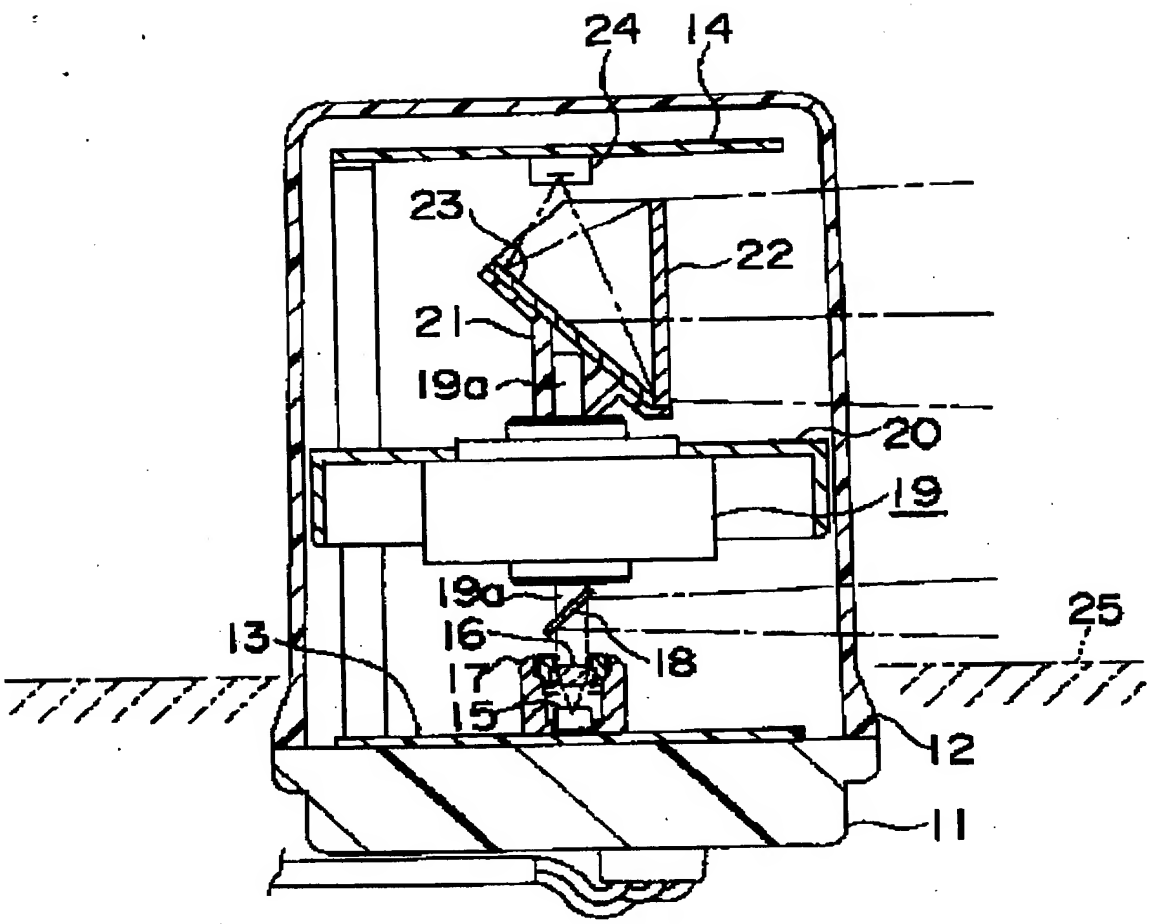
50:導光体
50a:凸面

[Drawing 4]



33a:嵌合部(被係合部)
51:中空軸
51a:中空部
53:ギア(動力伝達手段)
55:ピニオン(動力伝達手段)

[Drawing 6]



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